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UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

A TEN-COUNTRY ANALYSIS OF CATASTROPHE EXPOSURE, INSURANCE SECTOR AND COUNTRY FINANCIAL CAPACITY TO BEAR RISK

Background document by the UNCTAD secretariat

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Introduction and Background

1. The Work Programme of the Standing Committee, established at its first session on insurance, from 1 to 5 February 1993, requested the Committee, under part B, Fostering Competitive Insurance Services, "to examine alternative mechanisms to meet the insurance and reinsurance needs in respect of:

- Catastrophes;
- Environmental impairments; and
- Large risks;

particularly in times of reduced reinsurance capacity".

2. The Standing Committee at its second session, from 4 to 8 July 1994, affirmed that the study of catastrophes, environmental impairment and large risks should be continued. The Standing Committee agreed with the views expressed in the UNCTAD secretariat's study[2] that a significant contributing factor to the less than adequate levels of catastrophe insurance cover available in many developing countries may be the absence of adequate information on aggregate exposures, both in respect of assets at risk and perils capable of causing catastrophes.

3. The Standing Committee recommended that the secretariat conduct a test survey in 10 countries to collect comprehensive data on catastrophe exposures, with a view to collating the information and thus enabling insurers and reinsurers to have a better understanding of the problems.

4. This background paper attempts to illustrate the minimum level of information necessary before one can consider underwriting a catastrophe exposure. Following the second session of the Standing Committee in July, 1994, a questionnaire was distributed to the 10 countries. Their responses are summarized in the country data sections. The data in this document are based upon country reporting and, as a result, some of the figures may not correspond exactly with those contained in other United Nations statistical publications.

5. Availability of information varies widely among countries participating in the test survey and is reflected in the data each country has been able to collect. Most of the data has already been collected for other purposes, such as for town planning, local property taxation and records of local risks for fire services. The access and collection of all the data for insurance purposes has often not yet been fully achieved.

6. Without sufficient data, it is impossible to assess the risk-cost and hence the appropriate annual premium. This information is necessary whether it is intended to fund the risk locally and establish a catastrophe insurance scheme, or whether it is intended to insure or reinsure the risk in the local and international markets.

Algeria

Exposure to catastrophe perils

7. The catastrophe peril that threatens Algeria with the most extensive damage is earthquake. Seismological data from which to estimate the potential frequency and severity of events are available, but data on accumulation and exposure are incomplete. Accumulation Assessment Zones have been established for participating insurers to record their own exposures and estimates of overall uninsured values at risk. At the time of this writing, the values at risk in each zone and the sums insured by each zone could not be provided. Reflecting the current state of progress, the figures for exposure and potential loss costs are of necessity, estimates that will become more accurate, as soon as data from Algeria are available.

Infrastructure replacement costs

8. More accurate estimates of sums at risk will be available when Algerian insurers complete their recording of the accumulation by zone.

9. In the meantime, our estimate of a property sum insured has been made on the assumption that 80 per cent of the total fire premiums of US$ 48 million in 1992 were to insure real property. With an assumed average rate of 2.5 per mille, a figure of U$15 billion is the estimated value for the total property sums insured. The value of property fully insured against earthquake perils is likely to be significantly less as a large number of policy-holders do not choose to supplement their basic cover against fire with the earthquake cover extension.

10. The overall value of national assets exposed to destruction by earthquake is likely to be similar to the national income. If productivity could generate a rate of return on assets of 10 per cent, the total value would be 10 times the GNP, i.e. $450 billion. If only 10 per cent of property is in earthquake zones, then the value at risk would be roughly equal to the GNP.

11. When an earthquake occurs, the actual loss ratio depends not only on the magnitude of the quake but also on the type of occupancy of the buildings, the nature of their construction and the subsoil conditions.

12. Experience has shown that for an earthquake of MM 7.0 magnitude, a loss ratio in the range of 5 to 25 per cent is expected. If an earthquake were to affect 10 per cent of the assumed value in earthquake zones, annualized as a risk premium, this would be between 0.02 and 0.09 per cent of the GNP, where the return period is 30 years.

Insurance industry and national economy capacity to bear risk

13. Using the two estimates of $15 billion for values of property actually insured and $45 billion for property exposed to earthquake risk, there is a possibility of an overall loss between $0.2 billion and $1.1 billion if another earthquake of MM 7.0 magnitude affecting 10 per cent of insured properties were to occur tomorrow.

14. If all the insured property is covered for earthquake risk, and if it is all located within the area affected by the earthquake, expected losses would be between $750 million and $3,750 million, compared to the insurance industry's total Non-life Capital of $1,500 million and its non-life annual premium income of $260 million.

15. If only 10 per cent of property insured is covered for earthquake, the upper range for the expected loss would be equal to 25 per cent of total non-life Capital and 145 per cent of annual premiums.

16. At this stage, the use of reinsurance has intentionally not been considered. The decision on how much of a risk it is prudent to retain must first be made by comparing the maximum estimated loss with the financial resources locally available. Were it not for reinsurance, there would be no alternative but for these resources to bear the loss.

17. The insurance industry, although apparently well capitalized for the volume of business it is currently transacting, would require significant additional capital to be able to bear the earthquake risk if 100 per cent of all property insured included earthquake cover. An additional capital requirement of around 10 times the current level should be envisaged.

18. To provide cover for the whole national earthquake exposure, assuming that no more than 10 per cent by value of property at risk is within the zone affected by an earthquake, financing of funding arrangements for up to 2.5 per cent of the GNP may be required. For a return period of 30 years, this equates to an annual charge of about 0.1 per cent of GNP.

19. The funding would include the total of both public - and private - sector facilities. A portion may also be financed but this would require the ongoing cost of continuously maintaining in place the contracts with the banks and the other financial institutions to ensure that funds for reconstruction can be borrowed if an earthquake occurred.

20. This should also include measures to protect the catastrophe scheme against fluctuation of the Algerian currency in the aftermath of such large losses.

ALGERIA
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 26.4 million	**Population Growth Rate: 3 per cent**
Land area: 2,381,741 sq. km.	**Overall density: 11 per sq km**
Major Cities	**City Population (millions)**
Algiers	1.7 million
Annaba	0.3 million
Blida	0.2 million
Constantine	0.4 million
Oron	0.5 million
Setif	0.1 million
Sidi-bel-Abbès	0.1 million
	Total City Population 3.2 million
	Rural population density 10 per sq km

Exposure to Natural Perils		
Peril	Return Period	Severity
Earthquake	Approx. every 30 yrs.	MM. 7.0 (magnitude)

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	1992
Number of Non-Life Insurance Companies	5
Number of Reinsurance Companies	1

FINANCIAL SUMMARY*	US$ MILLIONS	
	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	-	1498
Unearned Premium Reserves	-	315
Claims Reserves	-	254
Free Reserves	-	276
Gross Inward Reinsurance Premiums	-	24
Total Annual Premiums	-	261
Gross Outward Reinsurance Premiums	-	25

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Net Annual Premiums	-	259
Total Property Sums Insured	-	* 15353
Total Property Insurance Premiums (i.e. Fire & Perils)	-	* 38
Total Catastrophe Premiums (Included in Total Property Premiums)	-	-
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	- -
Total Annual Cost of Such Treaties	(Lower) (Upper)	- -

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs

PROVISION OF CATASTROPHE COVER IN THE ALGERIAN MARKET *	
Catastrophe perils local insurers provide as an extension to their standard policies	-
Percentage of policies having such extensions	-
Percentage deductible required in respect of cover against catastrophe perils	-

* Information not provided

NATIONAL FINANCIAL RESOURCES	
Gross National Product 1993	US$ 45 billion
Growth Rate in Monetary Terms 1991/92	13 per cent
Value of Currency Unit	33 in SDRs 1993
Value of Currency Unit	5 in SDRs 1987
Currency Inflation relative to SDRs	37 per cent
Foreign Currency Reserves 1993	US$ 1,475 million
Gold Reserves 1993	US$ 268 million

VALUES AT RISK * **US$ millions**

Peril	Replacement value of property at risk	Insured against catastrophe peril
-	-	-

* (It is estimated that approximately per cent of property was insured against perils in 199)

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK **US$ MILLIONS**

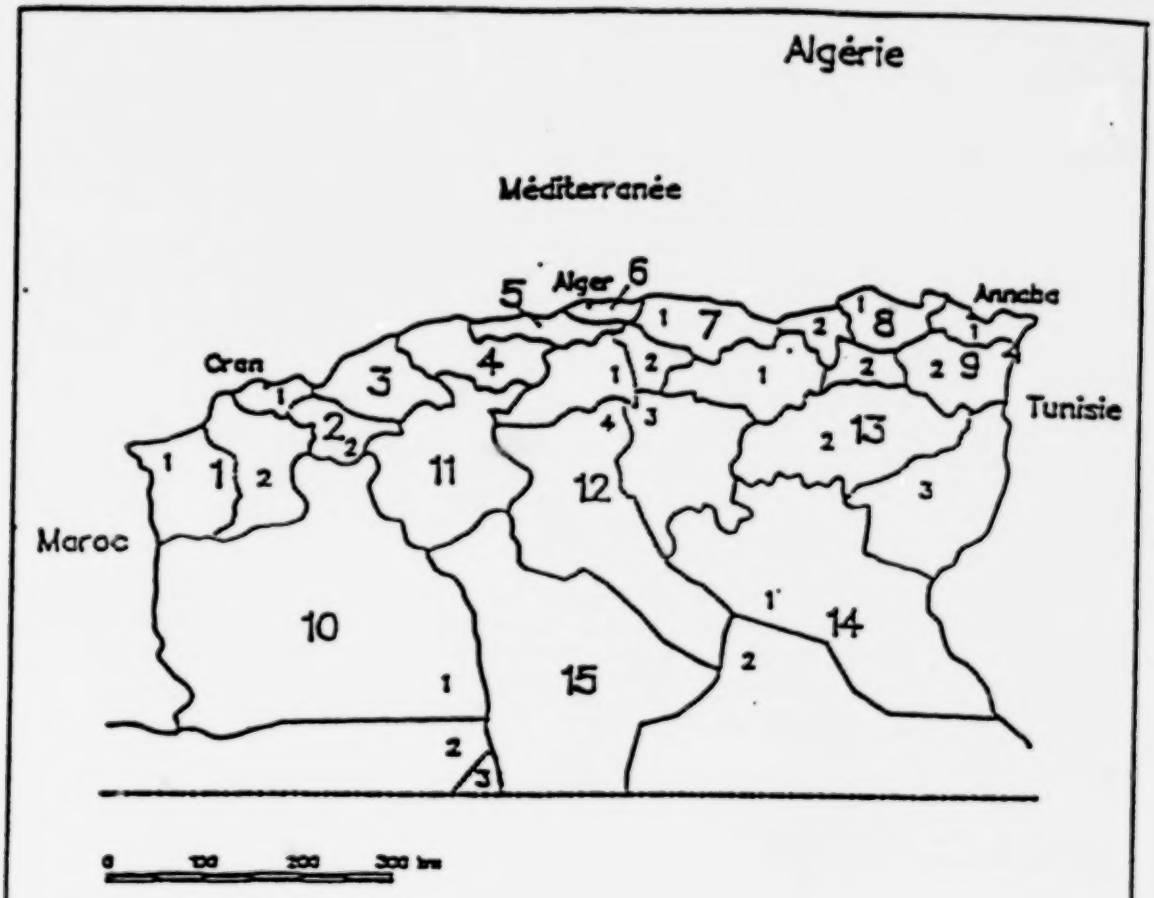
Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
*6,150	Sonatrach	Algiers 2 natural gas fields	Earthquake
*60	Enterprise Nationale de Travaux d'Electrification	Medea	"
*60	Germisider	Algiers	"
*220	Air Algerie	Algiers	"

* 50 per cent annual turnover

ACCUMULATION RISK US$ MILLIONS

Total value in zone	Zone number	Town/Region/ Urban area	Value insured against catastrophe perils *	Catastrophe perils to which exposed
Not available	Zone 1	Tiemcen, Sidi-bel-Abbès	-	-
"	Zone 2	Oron, Mascara	-	-
"	Zone 3	Mostaganem	-	-
"	Zone 4	Ech Cheliff	-	-
"	Zone 5	Blida	-	-
"	Zone 6	Alger	-	-
"	Zone 7	Tigi, Onzou, Jijel	-	-
"	Zone 8	Skikda, Constantine	-	-
"	Zone 9	Annaba, Guelma	-	-
"	Zone 10	Mechena, Béchan, Adrav	-	-
"	Zone 11	Tiaret	-	-
"	Zone 12	Medéa, Ain Bessem, Misila, Djelfa	-	-

ACCUMULATION RISK				US$ MILLIONS
Total value in zone	Zone number	Town/Region/ Urban area	Value insured against catastrophe perils *	Catastrophe perils to which exposed
"	Zone 13	Setif, Batna, Tebessa	-	-
"	Zone 14	Biskra, Ouargla, Tamahrasset	-	-
"	Zone 15	Laghouat	-	-



Zone 1

1 Tlemcen
2 Sidi-Bel-Abbès

Zone 2

1 Oran
2 Mascara

Zone 3

Mostaganem

Zone 4

Ech Cheliff

Zone 5

Blida

Zone 6

Alger

Zone 7

1 Tizi Ouzou
2 Jijel

Zone 8

1 Skikda
2 Constantine

Zone 9

1 Annaba
2 Guelma

Zone 10

1 Mecheria
2 Béchar
3 Adrar

Zone 11

Tiaret

Zone 12

1 Medéa
2 Ain Bessem
3 M'Sila
4 Djelfa

Zone 13

1 Sétif
2 Batna
3 Tébessa

Zone 14

1 Biskra
2 Ouargla
3 Tamanrasset

Zone 15

Laghouat

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Chile

Exposure to catastrophe perils

21. Chile is exposed to a large number of catastrophe perils, the most serious of which are of seismic origin.

22. Seismological data are well developed and the Association of Chilean Insurers has a continuing programme of cooperation and research relating to these risks. In addition to earthquakes Chile has a number of recently active volcanoes. The threat of damage from tsunami is also present, and landslip, windstorm, flood and bushfire are also recurring problems. For earthquakes, insurers are establishing country-wide records of their own exposures and estimates of overall uninsured values at risk. At the time of this writing, the values at risk in each zone and the sums insured in each zone could not immediately be provided to us. It was indicated that production of such data would be likely to take about three months. Without these figures, we have adopted some broad brushed estimates of overall exposure and potential loss costs which can be updated as soon as more accurate data are made available from Chile.

Infrastructure replacement costs

23. More accurate estimates of sums at risk will be available when Chilean insurers have completed their recording of accumulation by zone for the Catastrophe Risk Evaluating and Standardizing Target Accumulations (CRESTA) project in which local insurers in many countries are cooperating with international reinsurers to provide a worldwide database for catastrophe exposure. The amount for property sums insured is $ 215 billion.

24. The value of property fully insured against earthquakes is likely to be significantly less than $ 215 billion as a large number of policyholders do not choose to supplement their basic fire insurance by purchasing the earthquake cover extension.

25. The overall value of national assets exposed to destruction by earthquake can again be approximated by referring to the national income. If productivity could provide a rate of return on assets of 10 per cent, the total value would be 10 times the GNP, (i.e. $ 350 billion. In practice, however, the rate of return is likely to be lower, producing a higher asset value). Since much of Chile is in an earthquake zone, about 70 per cent of property is probably at risk, generating a value of $245 billion.

26. The actual loss ratio due to an earthquake depends not only on the magnitude of the quake, but also on the type of occupancy of the buildings, the nature of their construction and the subsoil conditions.

27. Experience has shown that for an earthquake of MM 8.5 magnitude, a loss ratio in the range of 10 to 55 per cent is expected. If 10 per cent by value of property were affected for a return period of 20 years, this can be annualized as a risk premium of between 0.05 and 0.25 per cent of the GNP.

Insurance industry and national economy capacity to bear risk

28. Bearing in mind the figure of $ 215 billion for values of property actually insured and the estimate of $ 245 billion for property exposed to earthquake risk, one should be prepared for a worst- case overall loss of between $ 2.4 billion and $ 13.5 billion if another earthquake of MM 8.5 affecting 10 per cent of property were to occur tomorrow.

29. If all the insured property was covered for earthquake risk, and if 10 per cent was located within the area affected by the earthquake, expected losses would be between $ 2.2 and $ 11.8 billion, compared with the insurance

industry's total non-life capital of $ 193 million and the non-life annual premium income of $ 593 million.

30. Catastrophe premiums represent 35 per cent of the total property insurance premiums. Obviously, not all the premiums are for earthquake risk, but if they were then for a rate between 0.5 and 2.75 per cent, the sums insured would be between $18 and $100 billion. Even the lowest value of $18 billion sums insured represents 50 per cent of the GNP and 93 times the total mon-life capital of the Chilean insurance industry and 30 times the total annual non-life premiums. Chilean insurers already have well-established reinsurance arrangements to leave them with an acceptable retention. The reinsurers provide capacity for the insurer's CESSION. The insurers are left with a RETENTION.

31. To cover the whole national earthquake exposure, assuming a maximum accumulation of 10 per cent within the zone affected by one earthquake, financing or funding arrangements for up to 43 per cent of the GNP could be required. For a return period of 20 years, this equates to an annual charge of about 2.1 per cent of the GNP.

32. Again, the funding would include the total of both public- and private-sector facilities, but it is unlikely that such a high exposure could be fundable as the charge against current income is likely to be more than the economy could bear. In this case, preparing a strategy for a financing solution to be implemented after the event would be prudent. This should also include measures to protect the catastrophe scheme against fluctuation of the Chilean currency in the aftermath of such large losses.

33. This should also include measures to protect the catastrophe scheme against fluctuation of the Chilean currency in the aftermath of such large losses.

CHILE
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 13.8 million	**Population Growth Rate: 2 per cent**
Land Area: 765,626 sq. km.	**Overall Density: 18 per sq km**
Major Cities	**City Population**
Antofagusta	0.2 million
Concepcion	0.3 million
Santiago	4.4 million
Talcahuano	0.2 million
Temuco	0.2 million
Valparaiso	0.3 million
Viña del Mar	0.3 million
	Total City Population 7.7 million
	Rural Population Density 8 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	**Return Period**	**Severity**
Earthquake	Approx. every 30 yrs.	MM. 7.0 (magnitude)
Volcanic Eruption	.	.
Tsunami	.	.
Landslip	Every year	Serious damage every 30 yrs.
Windstorm	Every year	Serious damage every 10 yrs.
Flood	Every year	Serious damage every 10 yrs.
Bushfire	Every year	Serious damage every 4-5 yrs.

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	1993
Number of Non-Life Insurance Companies	20
Number of Reinsurance Companies	103
FINANCIAL SUMMARY*	US$ MILLIONS

	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	None	1[illegible]3

FINANCIAL SUMMARY*

US$ MILLIONS

	Public-Sector Insurers	Private-Sector Insurers
Unearned Premium Reserves	-	136
Claims Reserves	-	89
Free Reserves	-	1
Gross Inward Reinsurance Premiums	-	125
Total Annual Premiums	-	593
Gross Outward Reinsurance Premiums	-	301
Net Annual Premiums	-	336
Total Property Sums Insured	-	215, 169
Total Property Insurance Premiums (i.e. Fire & Perils)	-	498
Total Catastrophe Premiums (Included in Total Property Premiums)	-	173
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	-
Total Annual Cost of Such Treaties	(Lower) (Upper)	-

*Estimate derived using assumptions described in the text under Infrastructure Replacement Costs

PROVISION OF CATASTROPHE COVER IN THE CHILEAN MARKET

Catastrophe Perils local insurers provide as an extension to their standard policies	Earthquake shock damage and fire following earthquake
Percentage of policies having such extensions	-
Percentage deductible required in respect of cover against catastrophe perils	2 per cent of sum insured plus 1oss deductible of 25 per cent for non-anteseismic design

The deductibles and coinsurance are a percentage of the sum insured.

NATIONAL FINANCIAL RESOURCES

Gross National Product 1993	US$ 35 billion
Growth Rate in Monetary Terms	6 per cent
Value of Currency Unit	589 in SDRs 1993

NATIONAL FINANCIAL RESOURCES	
Value of Currency Unit	338 in SDRs 1987
Currency Inflation relative to SDRs	10 per cent
Foreign Currency Reserves 1993	US$ 6453 million
Gold Reserves	US$ 629 million

VALUES AT RISK **US$ millions**

Peril	Replacement value of property at risk	Insured against catastrophe peril
.	.	.

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK **US$ MILLIONS**

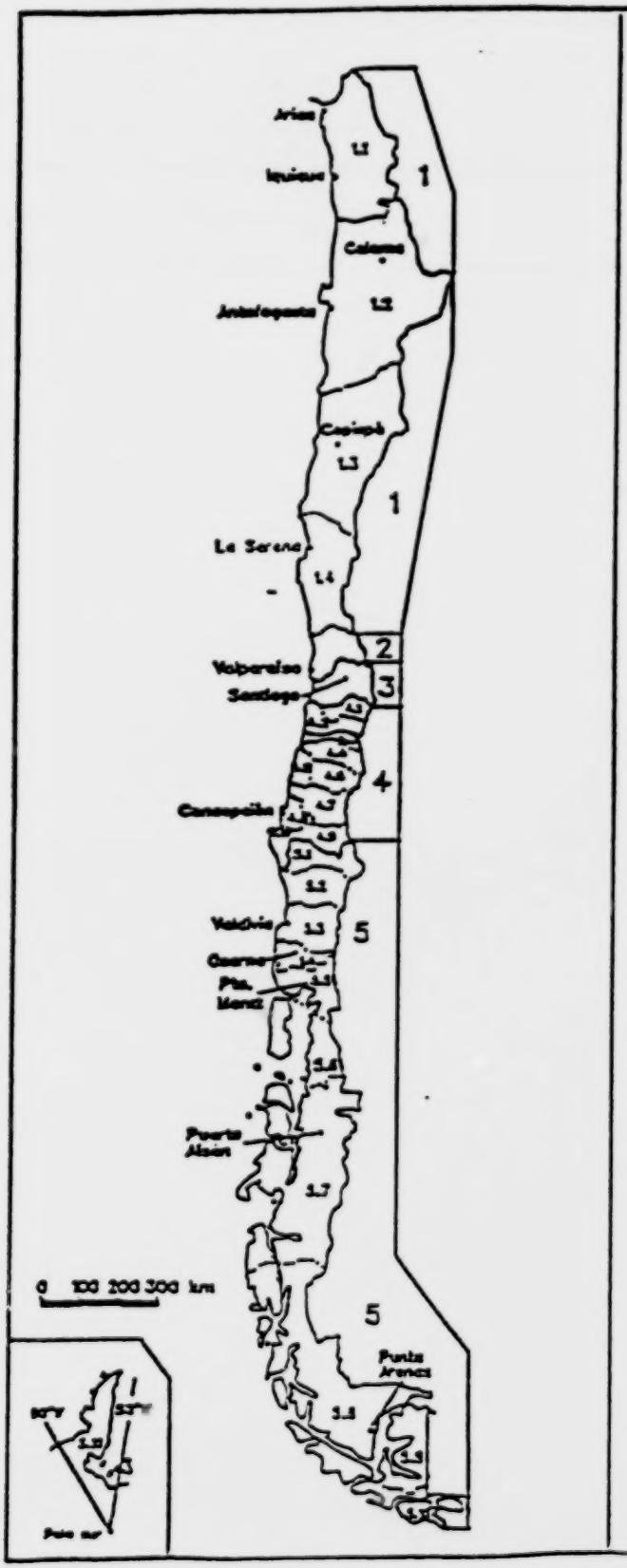
Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
942	ENDESA (Chilean Electric Co.)	Santiago + various other locations	Earthquake
82	Petrox Rejinenia	Concépcion	"
150	Empressa Nacional del Petroles	Santiago	"
43	Compania Siderurgica	Concépcion	"
49	Compania Manufacturera de Papeles y Cartones	Santiago	"
30	Sociedad Quimica y Minera de Chile	Santiago	"
-	CODELCO	Antofagusta	"

* 50 per cent annual turnover

ACCUMULATION RISK **US$ MILLIONS**

Total Value in Zone	Zone number	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
Not Available	Zone 1	Norte	-	-
"	Zone 2	Valparaiso/Aconcagua	-	-
"	Zone 3	Santiago	-	-

ACCUMULATION RISK				US$ MILLIONS
Total Value in Zone	Zone number	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
"	Zone 4	Centrales	-	-
"	Zone 5	Australes	-	-



Chile

Zona 1 Norte

- 1.1 Tarapacá
- 1.2 Antofagasta
- 1.3 Atacama
- 1.4 Coquimbo

Zona 2 Valparaiso/Aconcagua

Zona 3 Santiago

Zona 4 Centrales

- 4.1 O'Higgins
- 4.2 Colchagua
- 4.3 Curicó
- 4.4 Talca
- 4.5 Maule
- 4.6 Linares
- 4.7 Nuble.
- 4.8 Concepción
- 4.9 Bío—Bío
- 4.10 Arauco

Zona 5 Australes

- 5.1 Malleco
- 5.2 Cautin
- 5.3 Valdivia
- 5.4 Osorno
- 5.5 Llanquihue
- 5.6 Chiloé
- 5.7 Aisén
- 5.8 Magallanes
- 5.9 Tierra del fuego
- 5.10 Antarctica chilena

Cyprus

Exposure to catastrophe perils

34. Cyprus is exposed to earthquake, tsunami and landslip, of which landslip is the most frequent and localized risk. Tsunami, although a serious threat, has a return period of around 2,000 years. Earthquakes of MM 8.0 occur with a return period of approximately 120 years.

35. The insurers in Cyprus are cooperating in the pooling of seismological data and records of exposure. Data on accumulation and exposure are not yet complete. As in many other countries, Accumulation Assessment Zones have been established and participating insurers are recording data on their own exposures and estimates of overall uninsured values at risk.

36. At the time of this writing, although target risks have been identified, values and values at risk in each zone could not be provided. As for other countries where the data were not yet available, we have adopted some broad brushed estimates for the overall exposure and potential loss costs. As soon as more accurate data become available, these figures will be updated.

Infrastructure replacement costs

37. More accurate estimates of sums at risk should be available when Cypriot insurers complete their recording of accumulation by zone for the Catastrophe Risk Evaluating and Standardizing Target Accumulations (CRESTA) project, in which local insurers in many countries cooperate with international reinsurers to provide a worldwide database for catastrophe exposure.

38. In the meantime, our estimate of property sums insured has been generated on the assumption that 80 per cent of the total property insurance premiums of $ 12 million were to insure real property. Assuming an average rate of 2.5 per mille, $ 4.8 billion would be the estimated value for property sums insured. The value of property fully insured against earthquake perils is likely to be significantly lower as a large number of policy-holders do not choose to supplement their basic cover against fire by purchasing the earthquake cover extension. The overall value of national assets exposed to destruction by earthquake is likely to be about $ 29 billion.

39. Assuming that productivity will generate a rate of return on assets of 10 per cent is probably optimistic and will understate the value of assets. However, using this approximation the total value would be 10 times the GNP, i.e. $ 59 billion. If 50 per cent of property is located in earthquake zones, then the value at risk would be roughly 5 times the GNP.

40. When an earthquake occurs, the actual loss ratio depends not only on the magnitude of the quake, but also on the type and occupancy of buildings, the nature of their construction, and subsoil conditions.

41. Experience has shown that for an earthquake of MM 8.0 magnitude, a loss ratio in the range of 5 to 50 per cent is expected. If the area of Cyprus affected by an earthquake were to have an accumulation equal to 50 per cent of property values subject to earthquake, then, the annualized risk premium would be between 0.001 and 0.01 per cent of the GNP, where the return period is 120 years.

Insurance industry and national economy capacity to bear risk

42. Using the two estimates of $ 4.8 billion for values of property actually insured and $ 29 billion for property exposed to earthquake risk, there is the possibility of an overall loss between $ 1.5 billion and $ 15 billion if another earthquake of MM 8.0 magnitude were to occur tomorrow.

43. If all the insured property is covered for earthquake risk, and 50 per cent is located within the area affected by the earthquake, expected losses would be between $120 million and $1,200 million, compared to the insurance industry's estimated total non-life capital of $136 million and non-life annual premium income of $99 million.

44. If only 10 per cent of property insured is covered for earthquake, and again 50 per cent is within the area affected by the earthquake, then the upper range for the expected loss for insurers would be equivalent to 88 per cent of total non-life capital and 120 per cent of annual premiums. The abov figures were calculated before any reinsurance was taken into account.

45. Bearing in mind the insurers' current level of capitalization, the decision on how much of a risk it is prudent to retain must first be made by comparing the maximum estimated loss with the financial resources locally available. Were it not for reinsurance, there would be no alternative but fo these resources to bear the loss. As in many other countries, the insurance industry, although apparently well capitalized for the volume of business it is currently transacting, would require significant additional capital to be able to bear the earthquake risk if 100 per cent of all property insured included earthquake cover. An additional capital need of perhaps 30 times th current level should be envisaged.

46. To satisfy the objective of providing cover for the entire national earthquake exposure, financing or funding arrangements for an amount equivalent to 125 per cent of the GNP may be required. For a return period o 120 years, this equates to an annual charge of about 1 per cent of the GNP.

47. The extent to which such a potential loss is funded will include the total of both public- and private-sector facilities. However, it is unlikely that such a high exposure can be totally fundable out of the current national income. The balance will require financing and a strategy to establish such facilities, which could be called upon in the event of a loss exceeding current funding capabilities. This would be a prudent activity which should be continuously updated in readiness for a major catastrophe.

48. This should also include measures to protect the catastrophe scheme against fluctuation of the Cypriot currency in the aftermath of such large losses.

CYPRUS
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 722,800	**Population Growth Rate: 1.2 per cent**
Land Area: 9251 sq. km.	**Overall Density: 78 per sq km**
Major Cities	**City Population**
Nicosia	186.400
Limassol	143,400
Larnaka	64,000
Paphos	34,000
Famagusta	N/A
Kyrenia	N/A
	Total City Population 428,000
	Rural Population Density 32 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	Return Period	Severity
Earthquake	approx. every 120 yrs.[1]	MM. 8.0 Heavily Damaging[2]
Tsunami	approx. every 2000 yrs.	Damage
Landslip	approx. every year	Light damage
"	approx. every 15 yrs.	Destructive

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1993 Figures)
Number of Non-Life Insurance Companies	25
Number of Reinsurance Companies	0

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-S ector Insurers	Private-Sector Insurers
Total Non-Life Capital	-	32
Unearned Premium Reserves	-	32
Claims Reserves		51
Free Reserves	-	26

[1] Based on latest reports of reinsurers the return period is estimated at 200 - 250 years.

[2] The Definition is based on European Macroseismic scale 1992

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-S ector Insurers	Private-Sector Insurers
Gross Inward Reinsurance Premiums	-	-
Total Annual Premiums	-	84
Gross Outward Reinsurance Premiums	-	24
Net Annual Premiums	-	60
Total Property Sums Insured	-	15,431
Total Property Insurance Premiums (i.e. Fire & Perils)	-	19
Total Catastrophe Premiums (Included in Total Property Premiums)	-	6
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	L=0.5 U=38
Total Annual Cost of Such Treaties	(Lower) (Upper)	L=0.006 U=1.2

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs

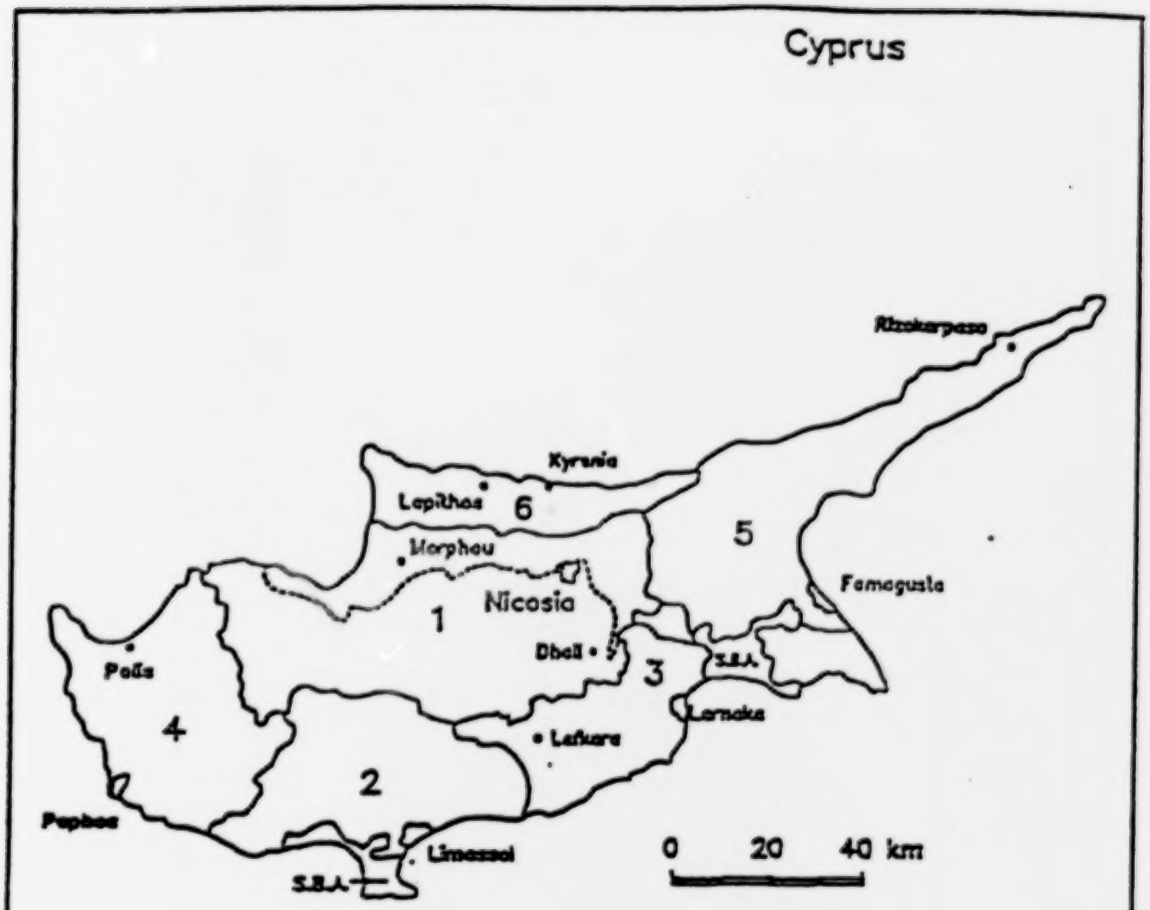
PROVISION OF CATASTROPHE COVER IN THE CYPRIOT MARKET	
Catastrophe perils local insurers provide as an extension to their standard policies	Earthquake
Percentage of policies having such extensions	80 per cent
Percentage deductible required in respect of cover against catastrophe perils	Optional
The deductibles and coinsurance are a percentage of the sum insured.	

NATIONAL FINANCIAL RESOURCES	
Gross National Product	US$ 6228 million
Growth Rate in Monetary Terms 1991/92	5 per cent
Value of Currency Unit	1.40 in SDRs 1993
Value of Currency Unit	1.61 in SDRs 1987
Currency Inflation relative to SDRs	2 per cent
Foreign Currency Reserves 1993	US$ 1,097 million
Gold Reserves 1993	US$ 14 million

VALUES AT RISK		US$ millions
Peril	Replacement value of property at risk	Insured against catastrophe peril
-	Data currently unavailable	-

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK			US$ MILLIONS
Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
-	Kourns Dam	Limassol	Earthquake
-	Asprokemos Dam	Paphos	"
-	Five Star Hotel	Limassol	"
-	Five Star Hotel	Paphos	"
-	Five Star Hotel	Lamaca	"
-	Electric Power Station	Limassol	"
-	Electric Power Station	Lamaca	"
-	Petroleum Refinery	Lamaca	"
-	Hospital	Limassol	"
-	Hospital	Paphos	"

ACCUMULATION RISK				US$ MILLIONS
Total Value in Zone	Zone Number	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
22980	Zone 1	Nicosia (North and South)	4728	Earthquake Landslip
15000	Zone 2	Limassol (i.e. U.K., S.B.A.)	3086	"
10380	Zone 3	Lamaca (i.e. U.K., S.B.A.)	2135	"
6840	Zone 4	Paphos	1407	"
4800	Zone 5	Famagusta	989	"
.	Zone 6	Kyrenia	.	"



Zone 1 Nicosia — north and south —
Zone 2 Limassol — incl. U.K. S.B.A. —
Zone 3 Larnaka — incl. U.K. S.B.A. —
Zone 4 Paphos
Zone 5 Famagusta
Zone 6 Kyrenia

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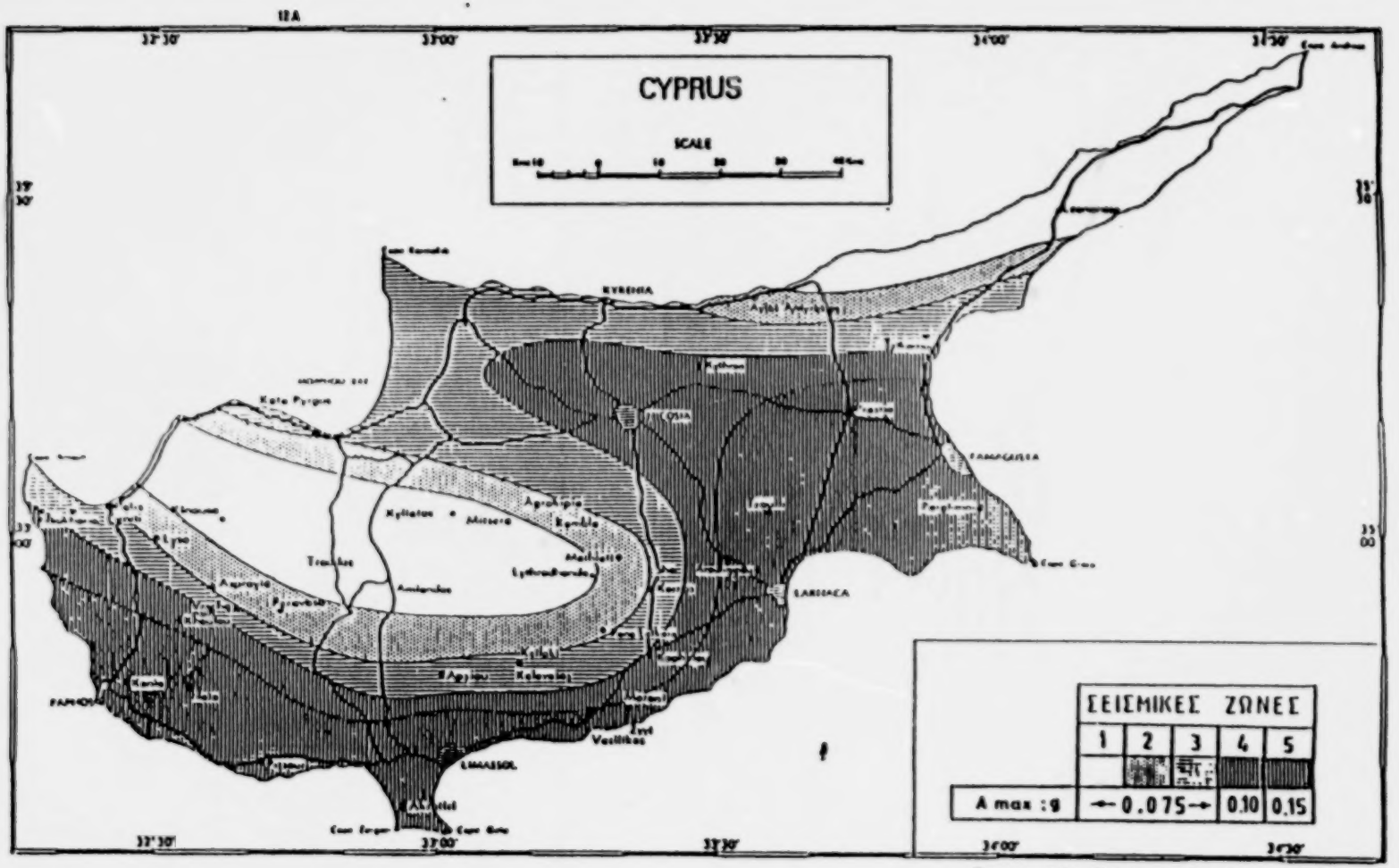


Σχ. 2 : Σεισμικός χάρτης της Κύπρου

Guatemala

Exposure to catastrophe perils

49. Guatemala is exposed to a large number of catastrophe perils, the most serious of which are of seismic origin. In addition to earthquakes, Guatemala is threatened by Volcanic Eruptions, Tsunami, Windstorm and Flood as recurring problems. However, earthquake is the major risk. Guatemala has well-developed data on exposures, including records of the values at risk and sums insured for each accumulation zone. Building codes to ensure construction have earthquake-resistant standards and have been in operation for many years.

Infrastructure replacement costs

50. Although Guatemala has detailed information on sums insured by accumulation zone, detailed estimates of replacement values were not available.

51. The figures for property sums insured were provided by the Guatemalan regulatory authority in response to our questionnaire. The total value for all zones is $5.6 billion, of which 100 per cent is also insured against catastrophe perils.

52. The overall value of the national assets exposed to destruction by earthquake is in excess of the property sums insured and, on the basis of our broad brushed estimates, is likely to be about eight times the value of the GNP. If productivity could generate a rate of return on assets of 10 per cent, the total value of the national assets would be about $110 billion. Since about 80 per cent of property in Guatemala is located in earthquake zones, the values at risk are about $88 billion. The actual loss ratio when an earthquake occurs depends not only on the magnitude of the quake but also on the type of occupancy of buildings, the nature of their construction and subsoil conditions.

53. Experience has shown that for an earthquake of MM 9.0 magnitude, a loss ratio in the range of 12 to 100 per cent is expected. If an earthquake were to affect 10 per cent of the estimated values in areas subject to earthquake, annualized as a risk premium which would be between 0.2 and 1.6 per cent of the GNP, where the return period is 50 years. The average loss ratio for an earthquake of MM 9.0 magnitude is 17 per cent which would be equivalent to 13.5 per cent of GNP, again assuming that a maximum of 10 per cent of property values subject to earthquake were affected.

Insurance industry and national economy capacity to bear risk

54. Using the value of $5.6 billion supplied by the Guatemalan regulatory authority for the value of property actually insured, and our estimate of $88 billion for property exposed to earthquake risk, one should be prepared for an overall loss of between $1.0 billion and $8.8 billion if another earthquake of 9.0 magnitude affecting 10 per cent of property values subject to earthquake were to occur tomorrow.

55. If 10 per cent of the insured property covered for earthquake risk is located within the area affected by the earthquake, expected losses would be between $67 million and $560 million, compared to the insurance industry's total non-life capital of $34 million (with $6.3 million free capital and reserves) and $76 million annual premium income.

56. Currently, Guatemala spends 49 per cent of premium income on reinsurance. This reflects the need for caution when deciding on the amount of risk to be retained, always bearing in mind the worst-case loss scenario relative to the financial resources locally available. Were it not for reinsurance, there would be no alternative but for these resources to bear the loss. Guatemalan insurers have carefully planned their risk retention and

reinsurance programmes in relation to their capitalization and the nature of the business they are transacting.

57. To retain more of the 49 per cent of premiums that they are currently ceding to reinsurers would be likely to require a much greater proportional increase in capital. A 10-fold increase would increase total capital and reserves to $340 million, which would still allow only a small retention of higher level catastrophe covers.

58. To provide cover for the entire natural earthquake exposure, financing or funding arrangements for up to 80 per cent of the GNP may be required. The annualized cost would be about 1.6 per cent of the GNP. Funding would include the total of both public- and private-sector facilities, but it is unlikely that such a high exposure could be totally fundable as the charge against current income is likely to be more than the economy could bear. In this case, a solution with both a strategy for financing the unfunded balance of damage in the event of a catastrophe protection measures against the fluctuation of the Guatemalan currency in the aftermath of such large losses would be prudent.

GUATEMALA
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 9.7 million	**Population Growth Rate:**
Land Area: 108,890 sq. km.	**Overall Density: 89 per sq km**

Major Cities	City Population
Cuidad de Guatemala	1.7 million
Esquintra	0.1 million
Quezal Tenango	0.1 million
	Total City Population 2.0
	Rural Population Density 71 per sq km

EXPOSURE TO NATURAL PERILS

Peril	Return Period	Severity
Earthquake	Approx. every 50 years	M. 9.0 (magnitude)

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1993 Figures)
Number of Non-Life Insurance Companies	13
Number of Reinsurance Companies	0

FINANCIAL SUMMARY* US$ MILLIONS

	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	0.3	6
Unearned Premium Reserves	2	15
Claims Reserves	1	10
Free Reserves	1	1
Gross Inward Reinsurance Premiums	0.01	2
Total Annual Premiums	9	67
Gross Outward Reinsurance Premiums	7	30
Net Annual Premiums	3	37
Total Property Sums Insured	1.792	10,762
Total Property Insurance Premiums (i.e. Fire & Perils)	7	18

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Catastrophe Premiums (Included in Total Property Premiums)	–	–
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	Lower: 5 Upper: 5	Lower: 0.3 Upper: 11
Total Annual Cost of Such Treaties	0.1	1

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs

PROVISION OF CATASTROPHE COVER IN THE GUATEMALAN MARKET	
Catastrophe Perils local insurers provide as an extension to their standard policies	Earthquake, Volcanic Eruption, Windstorm, Flood, Tsunami
Percentage of policies having such extensions	100 per cent
Percentage deductible required in respect of cover against catastrophe perils	20 per cent of loss plus 2 per cent of the sum insured

NATIONAL FINANCIAL RESOURCES	
Gross National Product 1993	US$ 11 billion
Growth Rate in Monetary Terms	0.18 per cent
Value of Currency Unit	11.4 in SDRs 1993
Value of Currency Unit	1.2 in SDRs 1987
Currency Inflation relative to SDRs	45 per cent
Foreign Currency Reserves 1993	US$ 736 million
Gold Reserves	US$ 9 million

VALUES AT RISK		**US$ millions**
Peril	Replacement value of property at risk	Insured against catastrophe peril
Earthquake, Volcanic Eruption, Windstorm, Flood	US$ 6 billion	US$ 6 billion

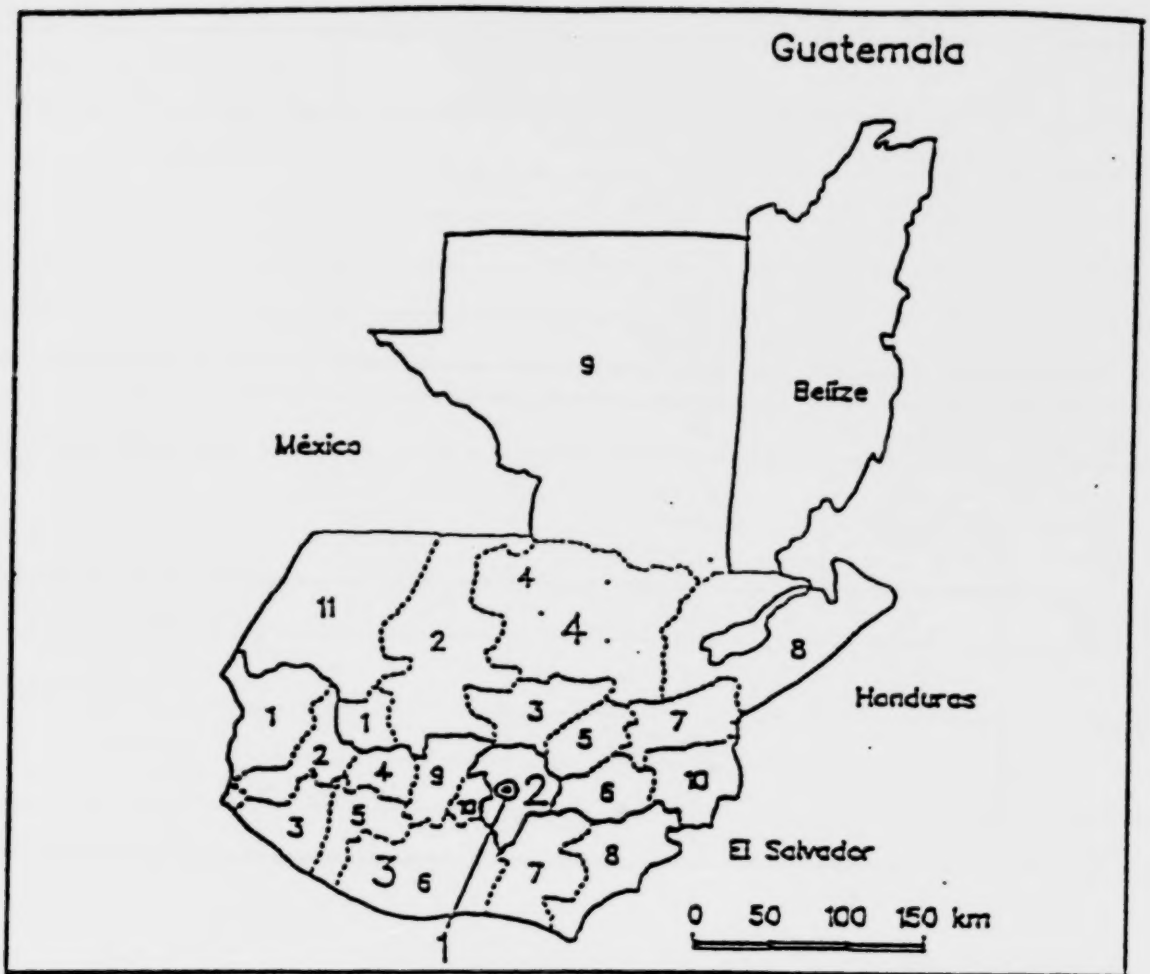
TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK **US$ MILLIONS**

Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
-	National Power Co.	-	Earthquake
-	National Telephone Co.	-	"
*64206	Cerinia SA	-	"
-	Guatemala Airport	-	"

* 50 per cent Annual turnover

ACCUMULATION RISK US$ MILLIONS

Total Value in Zone	Zone Number	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
3085	Zone 1	Guatemala City	3085	Earthquake
754	Zone 2	Guatemala District (excluding City)	754	"
696	Zone 3	Pacific Coast	696	+Tsunami
436	Zone 4	Other districts	436	"
656	Zone 5	-	656	"



Zona 1 Guatemala City

Zona 2 Departamento de Guatemala (excl. Guatemala City)

Zona 3 Costa Pacifica:

3.1	San Marcos	3.6	Escuintla
3.2	Quezaltenango	3.7	Santa Rosa
3.3	Retalhuleu	3.8	Jutiapa
3.4	Sololá	3.9	Chimaltenango
3.5	Suchitepequez	3.10	Sacatepequez

Zona 4 Otros departamentos:

4.1	Totonicapán	4.7	Zacapa
4.2	El Quiché	4.8	Izabal
4.3	Baja Verapaz	4.9	El Petén
4.4	Alta Verapaz	4.10	Chiquimula
4.5	El Progreso	4.11	Huehuetenango
4.6	Jalapa		

Mauritius

Exposure to catastrophe perils

59. The catastrophe peril that threatens Mauritius with widespread damage to the economy, agriculture and all types of activity on the island is windstorm.

60. Mauritius is located in an area subject to frequent tropical cyclone activity with windspeeds up to 250 kph. On average Mauritius is likely to be affected by 2.4 cyclones a year, but not all cause catastrophic damage. As far as its economy is concerned, since cyclone damage is indiscriminate about what lies in its path, damaging agriculture, tourism and commerce -- wherever the major force of the storm strikes. Records suggest a return period of about 80 years for the most serious storms, with storms that cause less damage occurring more often.

Infrastructure replacement costs

61. Mauritian insurers are participating in the ongoing Catastrophe Risk Evaluation and Standardizing Target Accumulations (CRESTA) exercise in which local insurers in many countries are cooperating with international reinsurers to provide a worldwide database for catastrophe exposure. At the time of this writing, the value at risk in each zone and sums insured by zone could not be provided. More accurate estimates of sums at risk will be generated when the Mauritian insurers have completed recording accumulation by zone. In the meantime, our estimate of property sums insured has been generated on the assumption that 80 per cent of the total fire and perils premiums of $14 million in 1992 were for insurance of real property. With an assumed average rate of 2.5 per mille, $ 5.8 billion would be the estimated value for the total property sums insured. The value of property fully insured against tropical cyclones is likely to be significantly less, as a large number of policy-holders do not supplement their basic cover against fire by purchasing the tropical cyclone extension.

62. The overall value of national assets exposed to tropical cyclones is likely to exceed the national income by a factor of 10 or more. The reasoning for this assumption is that the entire island is exposed to cyclones. If productivity could generate a rate of return on assets of 10 per cent the total value at risk would be 10 times the GNP -- $ 30 billion. If productivity generates less than a 10 per cent return, the value of assets at risk would be proportionately higher.

63. The actual loss ratio when a cyclone occurs depends not only on the wind velocity and pressures and associated rainfall and flooding, but also on the type and occupancy of the buildings and nature of their construction, height above sea level and the proximity to the coast. Experience has shown that for a cyclone with a wind velocity of 200 km/h, losses in the range of 5 to 20 per cent of replacement value can be expected. Annualized as a risk premium, this would be between 0.6 and 2.5 per cent of the GNP, where the return period is 80 years.

Insurance industry and national economy capacity to bear risk

64. Using the two estimates of $5.8 billion for values of property actually insured and $30 billion for property exposed to the risk of cyclone damage, there is a possibility of an overall loss between $1.5 billion and $7.5 billion if the whole island were to be subject to the full effects of a 200 km/h cyclone tomorrow.

65. If all the insured property was covered for cyclone risk and if it was all located within the area affected by the cyclone, losses would be between $270 million and $1,160 million. If only 10 per cent of the property insured is covered for cyclone risk, the upper range for the expected loss would be equal to 14 times the total non-life capital and 20 times the annual premiums.

66. This analysis purposely omits references to current reinsurance arrangements, as our intention is to contrast exposures with local financial capacity to bear risk so that decisions can be taken on how much of a risk should be retained and how much of the balance it may be desirable to reinsure, as well as considering how much may be available to pay for reinsurance. Without reinsurance, there would be no alternative but for local resources to bear the loss.

67. The insurance industry, although apparently adequately capitalized for the current volume and mix of business would require significant additional capital to be able to bear 100 per cent of the cyclone risk if all property insured included cyclone cover. An additional capital need of around 12 times the current level should be envisaged.

68. To provide cover for the whole national cyclone exposure, financing or funding arrangements for up to 250 per cent of GNP may be required. For a return period of 80 years, this is equal to an annual charge of about 3 per cent of GNP.

69. The Mauritius Sugar Crop Scheme already addresses part of this problem. Additional full funding for the island's total exposure is likely to be too much of an initial strain on the economy. A strategy for financing the unfunded amount in the event of a catastrophe would be prudent and should include protection measures against the fluctuation of the Mauritian currency in the aftermath of such large losses.

MAURITIUS
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 970,000	**Population Growth Rate: 1.6 per cent**
Land Area: 2045 sq. km.	**Overall Density: 475 per sq km**
Major City	**City Population**
Port Louis	138,975
	Total City Population 170,000
	Rural Population Density 392 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	**Return Period**	**Severity**
Windstorm	More than 3 per annum	Cyclone (120-250 km/ph)

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1992 Figures)
Number of Non-Life Insurance Companies	21
Number of Reinsurance Companies	2

FINANCIAL SUMMARY*		US$ MILLIONS
	Public Sector Insurers	Private Sector Insurers
Total Non-Life Capital	None	*85
Unearned Premium Reserves	-	*36
Claims Reserves	-	*16
Free Reserves	-	*8
Gross Inward Reinsurance Premiums	-	-
Total Annual Premiums	-	57
Gross Outward Reinsurance Premiums	-	31
Net Annual Premiums	-	26
Total Property Sums Insured	-	*5789
Total Property Insurance Premiums (i.e. Fire & Perils)	-	14
Total Catastrophe Premiums (Included in Total Property Premiums)	-	-

FINANCIAL SUMMARY*		US$ MILLIONS
	Public Sector Insurers	Private Sector Insurers
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	-
Total Annual Cost of Such Treaties	(Lower) (Upper)	-

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs.

PROVISION OF CATASTROPHE COVER IN THE MAURITIUS MARKET	
Catastrophe Perils local insurers provide as an extension to their standard policies	-
Percentage of policies having such extensions	-
Percentage deductible required in respect of cover against catastrophe perils	-
The deductibles and coinsurance are a percentage of the sum insured.	

NATIONAL FINANCIAL RESOURCES	
Gross National Product 1993	US$ 3 billion
Growth Rate in Monetary Terms	1.4 per cent
Value of Currency Unit	25.625 in SDRs 1993
Value of Currency Unit	15.718 in SDRs 1987
Currency Inflation relative to SDRs	8 per cent p.a.
Foreign Currency Reserves 1993	US$ 757 million
Gold Reserves	US$ 4 million

VALUES AT RISK		US$ millions
Peril	Replacement value of property at risk	Insured against catastrophe peril
-	-	-

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK			US$ MILLIONS
Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
-	Rodgers	-	-
-	Lonvho	-	-
-	Air Mauritius	-	-
-	Power Generation Co.	-	-
-	Telephone Company	-	-

ACCUMULATION RISK				US$ MILLIONS
Total Value in Zone	Name of zone	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	-	Port Louis	-	-
-	-	Remainder of Mauritius	-	-

MEXICO

Exposure to Catastrophe Perils

70. Mexico is subject to both earthquake and windstorm perils. Both are a significant cost to the Mexican economy and cause a large degree of suffering and loss of life.

71. Mexico has well- developed data on both hurricane and earthquake risk. Accumulation Assessment Zones have been established for some years and participating insurers maintain their own records of exposures and estimates of overall insured values at risk. At the time of this writing, the sums insured by zone were available but estimates of the overall insured values at risk could not be provided.

72. As a result, we have used broad brushed estimates generated from national income statistics for the total values at risk. For national values we have used the figures supplied. The figures for total values at risk can be updated as soon as more accurate and zone-specific data are available from Mexico.

Infrastructure Replacement Costs

73. Although Mexico has detailed information on sums insured by accumulation zone, detailed estimates of replacement values were not available. The figures for property sums insured were provided by the Mexican regulatory authority in response to our questionnaire. The total value for all zones is $ 311 billion. Not all property is insured for earthquake and hurricane as there are extensions, available on request, to the standard fire policy and an additional premium is required to cover the risk from these perils.

74. The overall value of national assets at risk is more than the value of insured property and this probably reflects the extent to which the location of these assets is exposed to the various perils.

75. If productivity could generate a rate of return on assets of 10 per cent the total value of national assets would be 10 times the GNP, or about $ 2.710 billion. Since about 80 per cent of property in Mexico is located in zones subject to earthquakes and hurricanes, the overall value at risk is about $ 2.200 billion. The proportion of these overall assets exposed to one incident will reflect their concentration in the zone affected by the peril. For example, the concentration in Mexico City is very high. The actual loss ratio depends in the case of an earthquake not only on the magnitude of the quake but also on the type of occupancy of the buildings, the nature of their construction, and subsoil conditions.

76. In the case of earthquakes, experience has shown that an earthquake of MM 8.0 magnitude can be expected to produce a loss ratio of between 5 and 50 per cent, with an average value of about 7.5 per cent. If an earthquake were to affect 10 per cent of the assumed value of property exposed to earthquake risk, then the annualized risk premium would be between 0.05 and 0.5 per cent of the GNP when the return period is 30 years.

Insurance Industry and National Economy Capacity to Bear Risk

77. Using the value of $ 311 billion supplied by the Mexican regulatory authority for the value of property actually insured, and our estimate of $ 2,200 billion for property exposed to earthquake risk, one should be prepared for an overall loss of between $ 5.5 billion and $ 1,100 billion if another earthquake of MM 8.0 magnitude were to occur tomorrow affecting an area containing 10 per cent by value of assets exposed to earthquake.

78. If all the insured property was covered for earthquake and 10 per cent was located within the area affected by the earthquake, expected losses would

be between $ 15 billion and $ 155 billion compared to the insurance industry's current total non-life capital and reserves of $7.7 billion (with $513 million fire reserves) and $3.6 billion premium income.

79. Currently, Mexican public-sector insurers spend 47 per cent of premium income buying reinsurance, whilst the private sector, which is four times larger, spends 26 per cent. This reflects the need to be prudent when deciding upon the amount of risk to be retained, always bearing in mind the worst-case loss scenario relative to financial resources available locally. Were it not for this reinsurance, there would be no alternative but for the local resources to bear the whole risk.

80. Mexican insurers have carefully planned their risk retention and reinsurance programmes in relation to their capitalization and the nature of the business they are currently transacting. To retain more of the premiums they are currently ceding to reinsurers is likely to require a far greater proportional increase in capital. A 10-fold increase in capital and all reserves to $15 billion would still allow only a small retention of higher level catastrophe covers.

81. To provide cover for the whole national earthquake exposure, financing or funding arrangements for an amount equivalent to up to 80 per cent of the GNP would be required and the annualized cost would be about 1.1 per cent of the GNP. It should be emphasized that this worst-case scenario is not very likely but it needs to be borne in mind when considering the adequacy of any solution which may be implemented.

82. It is unlikely that the entirety of such a high exposure could be funded because of the strain of the high level of charges against current income.

83. In this situation, a solution that comprises regular monitoring of funded balances and a strategy of financing the unfunded balance of damage in the event of a catastrophe would be prudent. The strategy should also include protection measures against the fluctuation of the Mexican currency in the aftermath of such large losses.

MEXICO
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 91.2 million	**Population Growth Rate: 3.4 per cent**
Land Area: 1,972,747 sq. km.	**Overall Density: 46 per sq km**
Major Cities	**City Population**
Ecatepec	0.74 million
Guadalajara	2.26 million
Cuidad de Mexico	13.87 million
Monterrey	1.08 million
Nezahualcoyotl	1.34 million
Puebla de Zaragoza	1.14 million
Tlalnepantla	0.78 million
	Total City Population 37 million
	Rural Population Density 27 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	**Return Period**	**Severity**
Earthquake	Approx. every 30 years	MM. 8.0 (magnitude)
Windstorm	-	Hurricane

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1993 Figures)
Number of Non-Life Insurance Companies	41
Number of Reinsurance Companies	2

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	114	438
Unearned Premium Reserves	354	1359
Claims Reserves	1,119	4299
Free Reserves	*107	406
Gross Inward Reinsurance Premiums	15	201

FINANCIAL SUMMARY*

US$ MILLIONS

	Public-Sector Insurers	Private-Sector Insurers
Total Annual Premiums	749	2,850
Gross Outward Reinsurance Premiums	352	735
Net Annual Premiums	733	2648
Total Property Sums Insured	64,243	246.89
Total Property Insurance Premiums (i.e. Fire & Perils)	159	598
Total Catastrophe Premiums (Included in Total Property Premiums)	0.05	0.18
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	-
Total Annual Cost of Such Treaties	(Lower) (Upper)	-

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs

PROVISION OF CATASTROPHE COVER IN THE MEXICAN MARKET

Catastrophe Perils local insurers provide as an extension to their standard policies	Fire following earthquake
Percentage of policies having such extensions	-
Percentage deductible required in respect of cover against catastrophe perils	2 per cent of earthquake sum insured co-insurance varies between 0 per cent - 25 per cent

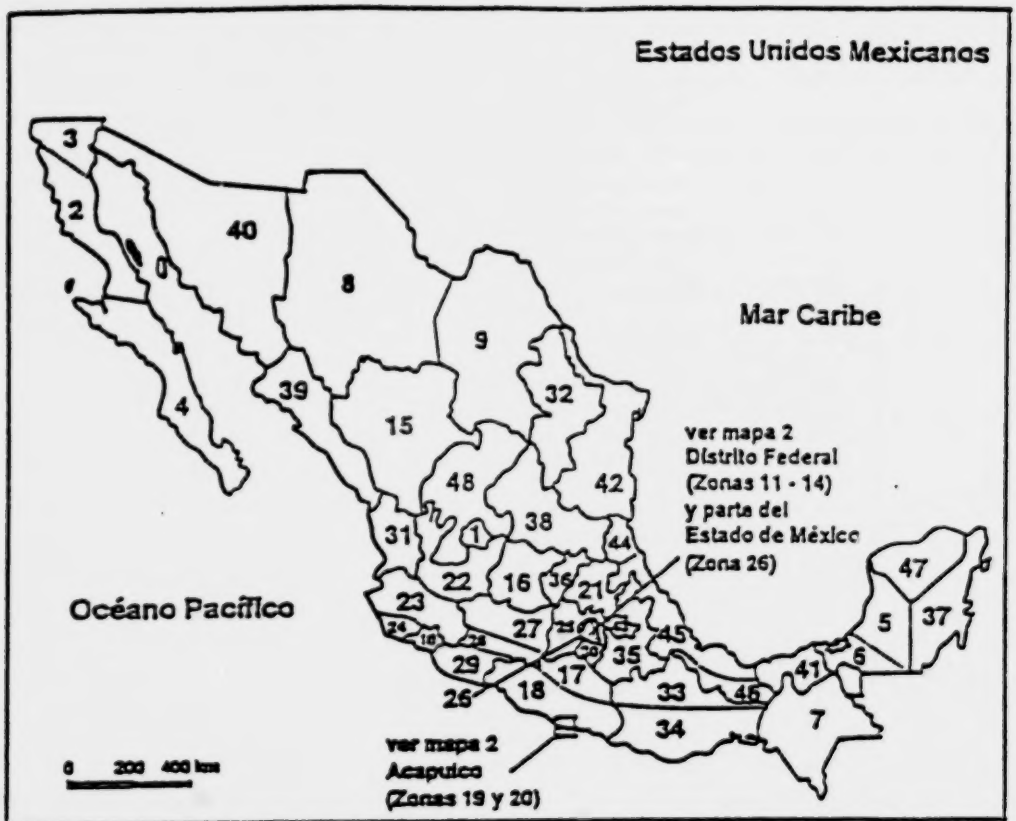
The deductible and coinsurance are a percentage of the sum insured.

NATIONAL FINANCIAL RESOURCES	
Gross National Product 1992	US$ 271 billion
Growth Rate in Monetary Terms (1991/92)	3 per cent
Value of Currency Unit	4.2661 in SDRs 1993
Value of Currency Unit	3.1348 in SDRs 1987
Currency Inflation relative to SDRs (1987-1993)	5 per cent
Foreign Currency Reserves 1993	US$ 25,110 million
Gold Reserves 1993	US$ 188 million

VALUES AT RISK		US$ millions
Peril	Replacement value of property at risk	Insured against catastrophe peril
.	.	.

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK			US$ MILLIONS
Value (1992)	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
1,097	Cemex S.A.	Monterrey	Earthquake Windstorm
1,050,908	Fomento Economico Mexicano S.A.	Monterrey	"
1,247	Groupo Industrial	Yanza Garcia	"
1,883,718	Petroleos Mexicano S.A.	Huasteca	"
3,323	Teléfonos de México	H.O. Piso	"
1,652	Vitro S.A.	Yanza Garcia	"
* 50 per cent Annual turnover			

ACCUMULATION RISK				US$ MILLIONS
Total Value in Zone	Name of zone	Town/Region/ Urban Area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	Zone A	Aguascalientes, Coahuila, Chihuahua, Durango, Nuevo León, Quintana Roo, San Luis Potosí, Tamaulipas, Yucatán, Zacatecas, Veracruz Norte, Campeche Norte	-	Earthquake Windstorm
-	Zone B	Baja California S. y N., Guanajuato, Hildalgo, México (excl.B1), Morelos, Nayarit, Puebla, Querétaro, Sinaloa, Tabasco, Tlaxcala, Jalisco Norte-Oriental, Michoacán Norte-Oriental, Sonora (excep. parte N.-Occid.), Veracruz Central, Campeche Sur	-	"
-	Zone B1	Jalatlaco, Ocoyoacac, Huixquilucan, Naucallapa Tlanepantla, Coacalco de Berriozabal, Ecatepec de Morelos, CD. Nezahualcoyotl, Los Reyes La Paz, Ixtapaluca, Chalco, Temamatla, Tenango del Aire, Juchitepec	-	-
-	Zone C	Baja California, Norte Sonora Norte Occidental, Jalisco Central, Michoacán Central, Guerrero Norte-Oriente. Oaxaca Norte, Veracruz Sur.	-	"
-	Zone D	Chiapas, Oaxaca Sur, Guerrero Sur - Occidental, Michoacán Sur-Occidental, Colima, Jalisco Sur-Occidental	-	"
-	Zone E	-	-	-
-	Zone J	-	-	-
-	Zone F	-	-	-
-	Zone G	-	-	-
-	Zone H1, H2	-	-	-
-	Zone I	-	-	-



Zona 1	Aguascalientes	Zona 15	Durango	Zona 32	Nuevo León
Zona 2	B.C.Norte	Zona 16	Guanajuato	Zona 33	Oaxaca Nor.Orie.
Zona 3	B.C.Norte	Zona 17	Guerrero Nor.Orie.	Zona 34	Oaxaca Sur Occi.
Zona 4	B.C.Sur	Zona 18	Guerrero Sur Occi.	Zona 35	Puebla
Zona 5	Campeche Nor.Orie.	Zona 19	Acapulco Resto (I)	Zona 36	Querétaro
Zona 6	Campeche Sur Occi.	Zona 20	Acapulco Relleno (J)	Zona 37	Quintana Roo
Zona 7	Chiapas	Zona 21	Hidalgo	Zona 38	San Luis Potosí
Zona 8	Chihuahua	Zona 22	Jalisco Nor.Orie.	Zona 39	Sinaloa
Zona 9	Coahuila	Zona 23	Jalisco Central	Zona 40	Sonora
Zona 10	Colima	Zona 24	Jalisco Sur Occi.	Zona 41	Tabasco
Zona 11	Distrito Federal (E)	Zona 25	México (B)	Zona 42	Tamaulipas
Zona 12	Distrito Federal (F)	Zona 26	México (B_1)	Zona 43	Tlaxcala
Zona 13a	D.F. (1-6 plantas) (G_1)	Zona 27	Michoacán Nor.Orie.	Zona 44	Veracruz Norte
Zona 13b	D.F. (7 plan. y más) (G_2)	Zona 28	Michoacán Central	Zona 45	Veracruz Central
Zona 14a	D.F. (1-6 plantas) (H_{c1})	Zona 29	Michoacán Sur Occi.	Zona 46	Veracruz Sur
Zona 14b	D.F. (7 plan. y más) (H_{c2})	Zona 30	Morelos	Zona 47	Yucatán
Zona 14c	D.F. (1-6 plantas) (H_{z1})	Zona 31	Nayarit	Zona 48	Zacatecas
Zona 14d	D.F. (7 plan. y más) (H_{z2})				

02/94

PERU

Exposure to Catastrophe Perils

84. Peru is exposed to potential catastrophe from Earthquakes, Tsunami and Flood. Seismological data is well developed and Peruvian insurers are participating in the Catastrophe Risk Evaluating and Standardizing Target Accumulation (CRESTA) project to develop a database for Peru. Local insurers in many countries are cooperating with international reinsurers in the CRESTA project to develop a worldwide database for catastrophe exposures.

85. The Peruvian regulatory authority, in response to our questionnaire, was able to provide information on sums insured against catastrophe perils by zone and on the location of major target risks. Information relating to total exposures including uninsured assets could not be provided at the time of this writing so we have used some broad estimates based on national income data. This information can be updated as soon as Peru provides more data.

Infrastructure Replacement Costs

86. The figures for property sums insured against earthquake have been provided by the Peruvian regulatory authority in response to our questionnaire. The total value of insured property for all zones is $ 4.5 billion. This would indicate that about 20 per cent of property insured for fire has cover extended to include earthquake. We have estimated the overall property sum insured on the assumption that, in 1993, 80 per cent of the total fire and perils premiums of $ 58 million were for insurance of real property. With an assumed average rate of 2.5 per mille, a figure of $23 billion is be the estimated value for total property sums insured.

87. The overall value of national assets exposed to destruction by earthquake can also be approximated by reference to the national income. Using an assumed rate of productivity on assets of 10 per cent would generate $ 380 billion (in practice, the rate of return is usually lower which suggests an even higher asset value). Since most of Peru is in an earthquake zone, say 60 per cent of property is likely to be at risk, generating $ 228 billion.

88. The actual loss ratio when an earthquake occurs depends not only on the magnitude of the quake but on the type of occupancy of the buildings, the nature of their construction, and subsoil conditions.

89. Experience has shown that for an earthquake of MM 8.0 magnitude, a loss ratio in the range 5 and 50 per cent is expected, with an average ratio of 7.5 per cent. Assuming that no more than 10 per cent by value of property at risk is within the zone affected by an earthquake, for a return period of 50 years this can be annualized as a risk premium of between 0.6 and 6 per cent of the GNP.

Insurance Industry and National Economy Capacity to Bear Risk

90. From the figures of $ 228 billion for property exposed to earthquake risk, $ 23 billion for property sums insured and $ 4.5 billion for the total value of property insured against earthquake, one can derive some estimates of expected worst-case losses for comparison with the insurance industry and national financial capacities.

91. For a worst-case overall loss, if another earthquake of MM 8.0 magnitude were to occur tomorrow, one should be prepared for costs between $ 1.1 billion and $ 11.4 billion, if a maximum of 10 per cent by value of property exposed to earthquake risk is within the area affected by the earthquake.

92. If all insured property were covered for earthquake risk and 10 per cent were located within the area affected by the earthquake, expected losses would be between $ 0.1 billion and $ 1.2 billion, compared with the insurance industry's total non-life capital of $ 139 million and non-life annual

premiums of $ 294 million.

93. For property currently insured against earthquake, again if 10 per cent were located within the area affected by the earthquake, the worst-case expected loss would fall between $ 22.5 million and $225 million.

94. To cover the whole national earthquake exposure financing, a funding arrangement for an amount up to 30 per cent of the GNP could be required. For a return period of 50 years, this equates to an annual charge of about 0.6 per cent of the GNP.

95. When calculating funding for such a catastrophe, all existing public-sector and private-sector facilities should be included. However, it is unlikely that the whole national exposure could be funded since, with other commitments, the economy could probably not sustain the heavy charges against existing income.

96. As for other countries with such a large contingent catastrophe financing need, it would be prudent to have a strategy in continuous readiness for when a catastrophe occurs. It should include protection measures against the fluctuations of the Peruvian currency in the aftermath of such large losses.

PERU
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 22.5 million	**Population Growth Rate: 2.5 per cent**
Land area: 1,285,216 sq.km.	**Overall Density: 18 per sq km**
Major Cities	**City Population**
Arequipa	0.6 million
Callas	0.5 million
Chiclayo	0.4 million
Chimbote	0.3 million
Lima	6.4 million
Piuva	0.3 million
Trujillo	0.5 million
	Total City Population 10.3 million
	Rural Population Density 9 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	**Return Period**	**Severity**
Earthquake	Approx. every 50 yrs	MM. 8.0 (magnitude)
Tsunami	Approx. every 100 yrs	_
Flood	Approx. every 10 yrs	_

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1993 Figures)
Number of Non-Life Insurance Companies	102
Number of Reinsurance Companies	5

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	31	108
Unearned Premium Reserves	5	39
Claims Reserves	58	70
Free Reserves	*10	125
Gross Inward Reinsurance Premiums	9	7

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Annual Premiums	44	250
Gross Outward Reinsurance Premiums	33	92
Net Annual Premiums	20	165
Total Property Sums Insured	*2,800	*23,200
Total Property Insurance Premiums (i.e. Fire & Perils)	7	58
Total Catastrophe Premiums (Included in Total Property Premiums)	-	-
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	-
Total Annual Cost of Such Treaties	(Lower) (Upper)	-
* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs		

PROVISION OF CATASTROPHE COVER IN THE PERUVIAN MARKET	
Catastrophe perils local insurers provide as an extension to their standard policies	Earthquake, Tsunami, Flood
Percentage of policies having such extensions	25 per cent
Percentage deductible required in respect of cover against catastrophe perils	Varies reflecting terms reinsurance treaties
The deductibles and coinsurance are a percentage of the sum insured and also replacement value.	

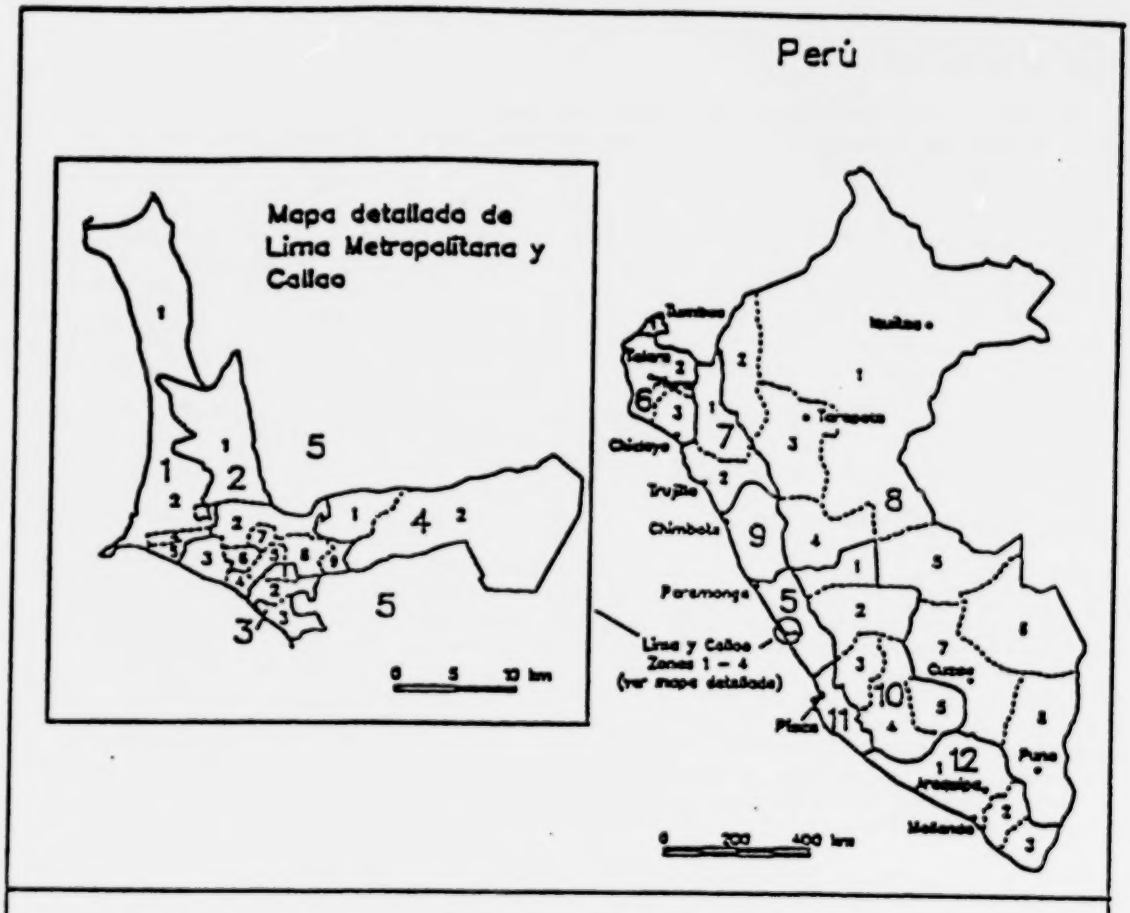
NATIONAL FINANCIAL RESOURCES	
Gross National Product 1993	US$ 38 billion
Growth Rate in Monetary Terms	0.8 per cent
Value of Currency Unit	0.34 in SDRs 1993
Value of Currency Unit	21,276 in SDRs 1987
Currency Inflation relative to SDRs	530 per cent p.a.
Foreign Currency Reserves 1993	US$ 2,241 million
Gold Reserves	US$ 516 million

VALUES AT RISK		US$ millions
Peril	Replacement value of property at risk	Insured against catastrophe peril
-	-	-
-	-	-

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK			US$ MILLIONS
Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
-	Petro-Perú	Lima-Talava	a) Earthquake b) Flood
-	Southern Perú Maching	Tacna-Moquequa	Earthquake
-	Centramin	Pasco	"
-	Hilvo Peru	Ica	"
-	Sider Peru	Ancash	"
-	Backus & Johnson	Lima	"
-	Cia. Nac de Cerveza	Callao	"
-	Hidvoelectica del M.	Junín	"
-	Cia Cerveza del Sur	Arequipa	"
-	Basr Naval del Callas	Callao	"

ACCUMULATION RISK				US$ MILLIONS
Total value in Zone	Zone Number	Town/region/ urban area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	-	Lima-Calloa	3684	Earthquake landslip
-	-	La Libertad	151	"
-	-	Ica	127	"
-	-	Arequipa	121	"
-	-	Ancadi	119	"
-	-	Tocna-Moquequa	98	"

ACCUMULATION RISK				US$ MILLIONS
Total value in Zone	Zone Number	Town/region/ urban area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	-	Junín	63	"
-	-	Piura	56	"
-	-	Pasco	46	"
-	-	Lambayeque	38	"
-	-	Cuzco	22	"



Zona 1
1 Ventanilla
2 Callao
3 Carmen de la Legua
4 Bellavista
5 La Perla
6 La Punta

Zona 2
1 San Martín de Porres
2 Lima
3 San Miguel
4 Magdalena del Mar
5 Jesús María
6 Pueblo Libre
7 Breña
8 La Victoria
9 San Luis

Zona 3
1 Lince
2 San Isidro
3 Miraflores

Zona 4
1 El Agustino
2 Ate

Zona 5
Barranco, Chorrillos, resto de la ciudad, de la provincia y del departamento de Lima

Zona 6
1 Tumbes
2 Piura
3 Lambayeque

Zona 7
1 Cajamarca
2 La Libertad

Zona 8
1 Loreto
2 Amazonas
3 San Martín
4 Huánuco
5 Ucayali
6 Madre de Dios
7 Cuzco
8 Puno

Zona 9
Ancash

Zona 10
1 Pasco
2 Junín
3 Huancavelica
4 Ayacucho
5 Apurímac

Zona 11
Ica

Zona 12
1 Arequipa
2 Moquegua
3 Tacna

PHILIPPINES

Exposure to catastrophe perils

97. The main catastrophe perils affecting the Philippines are Earthquake, Volcanic eruptions and Windstorms. Seismological data are available. Data on accumulation and exposure are incomplete.

98. The Philippines insurers are participating in the Catastrophe Risk Evaluating and Standardizing Target Accumulations (CRESTA) project in which local insurers in many countries are co operating with international reinsurers to provide a country-by-country worldwide database for catastrophe exposure. Accumulation assessment zones have been established for participating insurers to record their own exposures and estimates of overall uninsured values at risk. At the time of this writing, the values at risk in each zone and the sums issued by zone could not be provided. We have therefore developed some broad estimates for the exposure figures and potential loss costs. These can then be improved as soon as more accurate data become available from the Philippines.

Infrastructure Replacement Costs

99. More accurate estimates of sums at risk will be available when Philippines insurers have completed the exercise they are now engaged upon recording accumulation by zone. For current purposes, our estimate of the figure for total property sums insured is based on the assumption that in 1992, 80 per cent of the total fire and perils insurance premiums of $165 million were for insurance of real property. On the assumption that the average rate is 2.5 per mille, $66 billion is the estimated value for total property sums issued. The value of property issued against earthquakes and other catastrophe perils is likely to be signiiicantly less as a large number of policyholders do not supplement their basic cover against fire by purchasing earthquake and other catastrophe perils extensions.

100. The overall value of national assets exposed to destruction by earthquake and other catastrophe perils, including all uninsured assets, as well as our estimate of $66 billion for assets insured, is likely to be 10 times the level of the GNP (i.e. about $540 billion). This approximation is based upon an assumed productivity of 10 per cent on assets. If productivity is lower then the value of the underlying assets will be proportionately greater.

101. In the Philippines, 100 per cent of the land area is subject to earthquake and windstorm damage whilst there are some areas which may be less directly affected by volcanic eruption. The actual loss when an earthquake occurs depends not only on the magnitude of the quake but on the type of occupancy of the buildings, the nature of their construction, and subsoil conditions.

102. Experience has shown that for an earthquake of MM 7.0 magnitude, a loss ratio in the range of 1.5 to 20 per cent is expected, the average loss ratio being 2 per cent. If the value at risk in the area affected by the earthquake is no more than 10 per cent of the total national assets exposed to earthquake, then the annualized risk premium would be between 0.015 and 0.2 per cent of the GNP where the return period is 100 years.

Insurance Industry and National Economy Capacity to Bear Risk

103. From the estimates of $540 billion for the approximate value of national assets exposed to earthquake and windstorm risk and $66 billion for the value of property actually having some insurance cover, although a much lower value is insured against earthquake and windstorm, estimates of the costs for worst-case loss scenarios can be generated. These can then be compared with the national assets and income and also the assets and income of the insurance

industry to determine the extent to which the risk can be borne locally, and the proportion of income which may need to be utilized to purchase protection in the international markets because local capacity is inadequate.

104. As regards the total value of property exposed to earthquake risk, there is a possibility of an overall loss between $0.8 billion and $10.8 billion in the event of another earthquake of MM 7.0 magnitude affecting an area containing an accumulation of no more than 10 per cent of national assets.

105. If all insured property is covered for earthquake risk and 10 per cent is all located within the area affected by the earthquake, expected losses would be between $0.1 billion and $1.3 billion compared to the insurance industry's total non-life capital of $1.6 billion and non-life annual premium income of $523 million. If only 10 per cent of property insured is covered for earthquake the upper range of the expected loss would equate to about 8 per cent of total non-life capital and 25 per cent of annual premiums.

106. These basic figures provide a good initial background against which to decide the extent to which it is desirable to purchase reinsurance. The decision how much of a risk it is prudent to retain must first be made by comparing the maximum estimated loss with the financial resources available locally. This will generate a range of alternatives between using these financial resources to pay for international reinsurance or to retain more premium and carry more risk. Were it not for reinsurance, there would be no alternative but for these resources to bear the loss.

107. The insurance industry, although apparently well capitalized for the volume of business it is currently transacting, would require significant additional capital to be able to bear earthquake or windstorm risks if 100 per cent of property insured included cover against these perils. An additional capital need of at least five times the current level should be envisaged.

108. To provide cover for the whole national earthquake exposure, financing and funding arrangements for an amount equivalent to 100 per cent of the value of GNP may be required. For a return period of 100 years this equates to an annual charge of 1 per cent of the GNP.

109. Fully funding this level of exposure may not be possible initially in terms of the strain it would put on the economy. When calculating existing funding, all current private-sector and public-sector facilities should be included. It would be prudent to continuously monitor funded balances and provide a strategy for financing the unfunded balance of damage in the event of a catastrophe.

110. As with other countries in a similar situation, the strategy should include protection measures against the fluctuation of the Philippine currency in the aftermath of such large losses.

PHILIPPINES
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 65.7 million	**Population growth rate: 2.3 per cent**
Land Area: 300,000 sq.km.	**Overall Density: 219 per sq km**
Major Cities	**City Population**
Manila	1.9 million
Quezon City	1.6 million
Davao	0.8 million
Cebu	0.6 million
Caloocan	0.6 million
Zamboanga	0.4 million
Makati	0.4 million
	Total City Population 13.7 million
	Rural Population Density 173 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	Return Period	Severity
Earthquake	approx. every 100 yrs.	MM. 7.0 (magnitude)
Volcanic Eruption	approx every 50 yrs.	-
Windstorm	3 per annum	Typhoon (250 kph)

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1992 Figures)
Number of Non-Life Insurance Companies	100
Number of Reinsurance Companies	3

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	-	*1630
Unearned Premium Reserves	-	*270
Claims Reserves	-	*14
Free Reserves	-	*507
Gross Inward Reinsurance Premiums	-	103
Total Annual Premiums	-	523

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Gross Outward Reinsurance Premiums	-	270
Net Annual Premiums	-	252
Total Property Sums Insured	-	*65,923
Total Property Insurance Premiums (i.e. Fire & Perils)	-	165
Total Catastrophe Premiums (Included in Total Property Premiums)	-	-
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	-
Total Annual Cost of Such Treaties	(Lower) (Upper)	-

* Estimate derived using assumptions described in the test under Infrastructure Replacement Costs.

PROVISION OF CATASTROPHE COVER IN THE PHILLIPINEAN MARKET	
Catastrophe Perils local insurers provide as an extension to their standard policies	Five following Earthquake Earthquake Shock
Percentage of policies having such extensions	-
Percentage deductible required in respect of cover against catastrophe perils	For earthquakes shock only 2 per cent of actual property value at time of loss - minimum US$ 36,000
The deductibles is a percentage of the market value of the property immediately before the loss.	

NATIONAL FINANCIAL RESOURCES	
Gross National Product	US$ 54 billion (1993)
Growth Rate in Monetary Terms 1992/93	2 per cent
Value of Currency Unit	38.046 in SDRs 1993
Value of Currency Unit	20.905 in SDRs 1987
Currency Inflation relative to SDRs	10 per cent p.a.
Foreign Currency Reserves 1993	US$ 4676 million
Gold Reserves 1993	US$ 1245 million

VALUES AT RISK — US$ millions

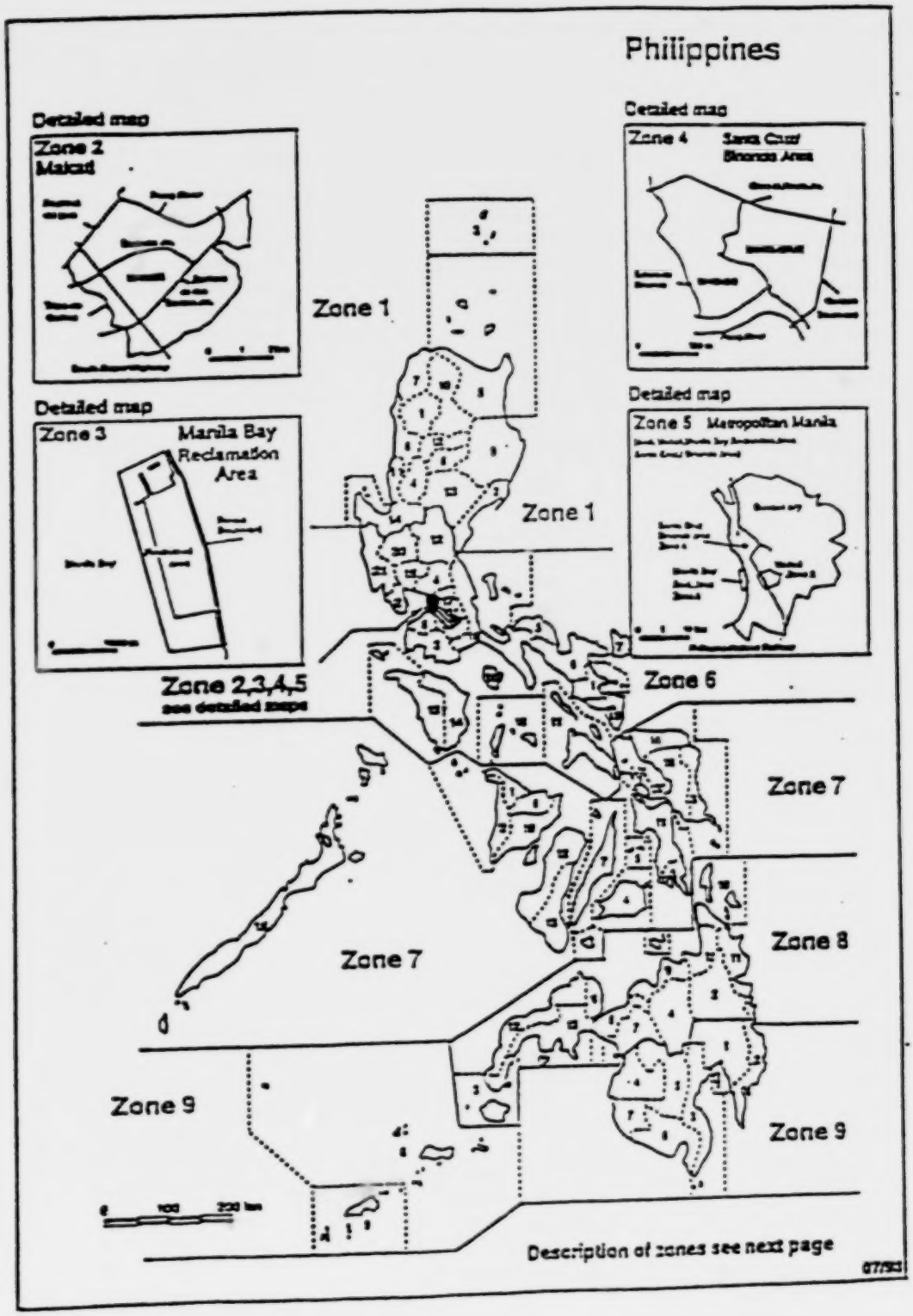
Peril	Replacement value of property at risk	Insured against catastrophe peril
-	-	-

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK — **US$ MILLIONS**

Value	Risk (Name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
*1828	San Miguel Corp	-	Earthquake, volcano, windstorm
*785	Manila Electric Co.	-	"
*471	Philippines Long Distance Telephone Co.	-	"
*300	Nihoy Aquino Airport	-	"
*190	Atlas Consolidated Mining & Dev. Corp.	-	"
*152	RFM Corp.	-	"
*144	Benquet Corp.	-	"

ACCUMULATION RISK — US$ MILLIONS

Total value in zone	Zone Number	Town/region/ urban area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	Zone 1	See accompanying sheet for locations	-	Earthquake, volcano, windstorm
-	Zone 2	-	-	"
-	Zone 3	-	-	"
-	Zone 4	-	-	"
-	Zone 5	-	-	"
-	Zone 6	-	-	"
-	Zone 7	-	-	"


Philippines
Detailed map
Zone 2
Makati
Detailed map
Zone 4
Detailed map
Zone 3
Manila Bay
Reclamation
Area
Detailed map
Zone 5
Zone 1
Zone 1
Zone 2,3,4,5
see detailed maps
Zone 6
Zone 7
Zone 8
Zone 7
Zone 9
Zone 9
Description of zones see next page

Philippines

Zone 1

1 Abra
2 Aurora
3 Bataanes
4 Benguet
5 Cagayan
6 Ifugao
7 Ilocos Norte
8 Ilocos Sur (Quirino)
9 Isabela
10 Kalinga-Apayao
11 La Union
12 Mountain Province
13 Nueva Vizcaya
14 Pangasinan

Zone 2

Makati (Manila)

Zone 3

Manila Bay
Reclamation Area
(Manila Bay City)

Zone 4

Santa Cruz/
Binondo Area
(Manila)

Zone 5

Metropolitan Manila
(excluding Makati,
Manila Bay City and
Santa Cruz/Binondo)

Zone 6

1 Albay
2 Batan
3 Batangas
4 Butuan
5 Camarines Norte
6 Camarines Sur
7 Catanduanes
8 Cavite
9 Laguna
10 Marinduque
11 Masbate

Zone 6

12 Nueva Ecija
13 Occidental Mindoro
14 Oriental Mindoro
15 Pampanga
16 Quezon
17 Rizal
18 Romblon
19 Sorsogon
20 Tarlac
21 Zambales

Zone 7

1 Aklan
2 Antique
3 Biliran
4 Bohol
5 Camotes
6 Capiz
7 Cebu
8 Eastern Samar
9 Guimaras
10 Iloilo
11 Leyte
12 Negros Occidental
13 Negros oriental
14 Northern Samar
15 Palawan
16 Siquijor
17 Southern Leyte
18 Western Samar

Zone 8

1 Agusan del Norte
2 Agusan del Sur
3 Basilan
4 Bukidnon
5 Camiguin
6 Lanao del Norte
7 Lanao del Sur
8 Misamis Occidental
9 Misamis Oriental
10 Surigao del Norte
11 Surigao del Sur
12 Zamboanga del Norte
13 Zamboanga del Sur

Zone 9

1 Davao del Norte
2 Davao Oriental
3 Davao del Sur
4 Maguindanao
5 North Cotabato
6 South Cotabato
7 Sultan Kudarat
8 Sulu
9 Tawi-Tawi

07/93

Saint Kitts and Nevis

Exposure to catastrophe perils

111. Saint Kitts and Nevis is exposed to both Windstorm and Earthquake risks. Seismological data and data on hurricane activity for the East Caribbean estimating the frequency and severity of events are available. Data on accumulation and exposure are incomplete. Accumulation Assessment Zones have been established for participating insurers to record their own exposures and estimates of overall uninsured values at risk. At the time of this writing paper the values at risk in each zone and sums insured by zone could not be provided. We have therefore used some broad estimates which can be improved as soon as more accurate data becomes available.

112. A notable difference in the approach to risk retention in Saint Kitts and Nevis, when compared to the other countries in our sample, is that Saint Kitts and Nevis relies on the operation of foreign insurers establishing branches within its territory to provide cover for insured risks. Thus insured losses are automatically transferred outside the island's economy provided that there is no failure in the security of those international companies providing cover for local risks. The decision not to have an indigenous insurance sector is clearly indicated in situations where there are insufficient numbers of risks to obtain a satisfactory statistical spread, or where the concentration of risks is so high that they cannot be regarded as independent.

Infrastructure replacement costs

113. Insurers operating in Saint Kitts and Nevis are participating in the ongoing Catastrophe Risk Evaluation and Standardizing Target Accumulations (CRESTA) exercise in which local insurers in many countries are co operating with international reinsurers to provide a worldwide database of individual country catastrophe exposures. At the time of this writing the values at risk in each zone could not be provided.

114. In the meantime our estimate for an appropriate value for national assets exposed to destruction by earthquake and windstorm is possibly more than 10 times the GNP. If productivity could generate a rate of return on assets of 10 per cent, the total value of assets would be 10 times GNP suggesting $1,158 million. If productivity is lower than 10 per cent then the value of the underlying assets would be proportionately higher.

115. The actual loss ratio when an earthquake or windstorm occurs depends not only upon the magnitude of the quake or the force of the wind but also on the type of occupancy of buildings, the nature of their construction, and for earthquake the subsoil conditions. Experience has shown that for an earthquake of 9.0 magnitude a loss ratio of between 12 and 100 per cent is expected. The average loss ratio for an earthquake of MM 9.0 magnitude is being about 20 per cent. Annualized to cover all exposed national assets, this would amount to a risk premium of between 0.8 and 6.6 per cent of GNP where the return period is 150 years.

116. For a hurricane with a wind velocity of 200 kph, a loss ratio between 5 and 25 per cent, with an average ratio of 8 per cent, is to be expected. Annualized to cover all exposed assets, this would amount to a risk premium of between 0.66 and 3.3 per cent of GNP where the return period is 75 years.

Insurance industry and national economy capacity to bear risk

117. Saint Kitts and Nevis' reliance upon international insurers to provide cover for insured risks has the effect of "reinsuring" 100 per cent of these risks outside the local financial sector. To provide cover for the whole national exposure to earthquake and hurricane, as indicated in the previous section, may require funding or financing arrangements up to 10 times the GNP.

Earthquake and hurricane are independent events so the cost of protection against both would amount to the sum of the annualized costs mentioned abov i.e. between 1.5 and 10 per cent of the GNP.

118. For uninsured values it would be prudent to implement a strategy for contingency financing to meet reconstruction costs in the event of a catastrophe.

119. This should also include measures to protect the catastrophe scheme against fluctuation of the Saint Kitts and Nevis' currency in the aftermath such large losses.

ST KITTS & NEVIS
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 40,000	**Population Growth Rate: 0.0%**
Land Area: 267 sq.km.	**Overall Density: 150 per sq km**
Major City	**City Population**
Basse-Terre	14,000
	Total City Population 14,000
	Rural Population Density 97 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	Return Period	Severity
Earthquake	approx. every 100 yrs.	MM. 8.0 (magnitude)
-	approx every 150 yrs.	MM. 9.0 (magnitude)
Windstorm	7 per annum	Tropical storms
-	3 per annum	Hurricane

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	
Number of Non-Life Insurance Companies	-
Number of Reinsurance Companies	-

FINANCIAL SUMMARY* US$ MILLIONS

	Public-Sector Insurers	Private Sector Insurers
Total Non-Life Capital	-	-
Unearned Premium Reserves	-	-
Claims Reserves	-	-
Free Reserves	-	-
Gross Inward Reinsurance Premiums	-	-
Total Annual Premiums	-	-
Gross Outward Reinsurance Premiums	-	-
Net Annual Premiums	-	-
Total Property Sums Insured	-	-
Total Property Insurance Premiums (i.e. Fire & Perils)	-	-
Total Catastrophe Premiums (Included in Total Property Premiums)	-	-

FINANCIAL SUMMARY*		US$ MILLIONS
	Public-Sector Insurers	Private Sector Insurers
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	(Lower) (Upper)	.
Total Annual Cost of Such Treaties	(Lower) (Upper)	.

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs.
Note: These islands are serviced by branch offices of international insurers.

PROVISION OF CATASTROPHE COVER IN THE ST KITTS and NEVIS MARKET	
Catastrophe perils local insurers provide as an extension to their standard policies	Earthquake, Volcanic Eruption, Hurricane, Cyclone, Tornado or Windstorm
Percentage of policies having such extensions	.
Percentage deductible required in respect of cover against catastrophe perils	EC$ 250 Industrial and Commercial EC$

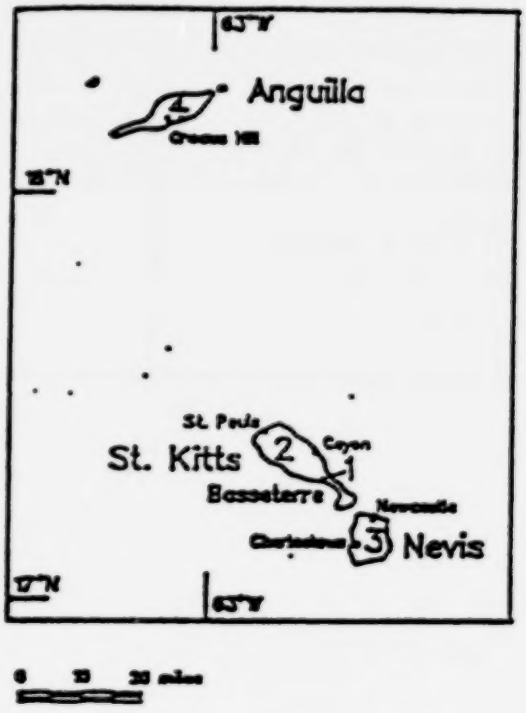
NATIONAL FINANCIAL RESOURCES	
Gross National Product	US$ 158 million
Growth Rate in Monetary Terms 1992/93	4 per cent
Value of Currency Unit	3.7086 in SDRs 1993
Value of Currency Unit	3.8304 in SDRs 1987
Currency Inflation relative to SDRs	0.5 per cent
Foreign Currency Reserves 1993	US$ 29.42 million
Gold Reserves 1993	Nil

VALUES AT RISK		US$ millions
Peril	Replacement value of property at risk	Insured against catastrophe peril
.	.	.

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK			US$ MILLIONS
Value	Risk (name of enterprise)	Location (Town/Province, etc.)	Catastrophe perils to which exposed
.	.	.	.

ACCUMULATION RISK				US$ MILLIONS
Total value in zone	Zone Number	Town/region/ urban area	Value insured against catastrophe perils	Catastrophe perils to which exposed
-	Zone 1	Basse-Terre	-	Earthquake Windstorm
-	Zone 2	Rest of St. Kitts (includes St. Pauls, Cayon)	-	"
-	Zone 3	Nevis (includes Newcastle, Charlestown)	-	"
-	Zone 4	Aguila (includes Crocus Hill)	-	"

St. Christopher – Nevis



Zone 1 Basseterre
Zone 2 Rest of St. Kitts
Zone 3 Nevis
Zone 4 Anguilla

TURKEY

Exposure to Catastrophe Perils:

120. The major catastrophe risk affecting Turkey is Earthquake. Windstorm is a more localized problem. Seismological data are well developed. Turkish insurers have completed their recordings of accumulations by zone for the Catastrophe Risk Evaluation and Standardizing Target Accumulations (CRESTA) project in which local insurers in many countries are co operating with international reinsurers to provide a worldwide database of individual country-catastrophe exposures.

121. Insured values by zone and target risks have all been identified, as well as country-wide total values at risk. The breakdown of total value by zone was not available to be included in the Turkish regulator's response to our questionnaire. When total value by zone has been identified more precise estimates of the aggregate potential loss costs for an earthquake affecting a particular region will be possible.

122. Of our 10-country sample, Turkey provided the most comprehensive response to our questionnaire,

Infrastructure Replacement Costs

123. In response to our questionnaire, the Turkish regulatory authority provided figures for values at risk, property sums insured and sums insured against catastrophe perils. The overall value of national assets exposed to earthquake could not be provided so, as in the case of the other countries, a broad estimate has been generated based on GNP.

124. If productivity could generate a return on assets of 10 per cent the total asset value would be 10 times the GNP -- $1,560 billion. (If, in practice, the rate of return is lower than 10 per cent then the asset value will be proportionately higher.) Since about 60 per cent of Turkey is in an earthquake zone, the proportionate value would amount to $936 billion. Obviously, this approximation does not take into account higher concentrations of value in different zones, but provides a good starting point in the absence of more precise information.

125. The figure for total property sums insured provided by the Turkish regulatory authority is $76 billion, whilst the values in areas subject to windstorm risk is $14 billion. The value of property fully insured against earthquake is $16 billion and for property insured against windstorm is $2.8 billion. Expected losses from an earthquake or windstorm depends not only on the magnitude of the quake or the windstorm but also on the type of occupancy of the buildings, the nature of their construction, and, for earthquake, the subsoil conditions.

126. Experience has shown that for an earthquake of MM 7.0 magnitude, a loss ratio in the range of 1 to 20 per cent with an average value of 2 per cent is to be expected. If the area affected by the earthquake, contains an accumulation of 10 per cent of total national values exposed to earthquake then for a return period of 100 years this can be annualized as a risk premium of between 0.001 and 0.01 per cent of the GNP.

127. Windstorm losses due to tornado are more localized than earthquake. For a windstorm of 400 km ph, a loss ratio in the range of 50 to 100 per cent, with an average value around 80 per cent is to be expected. For a return period of 9,000 years per location, this can be annualized as a risk premium between 5.6 per mille and 1.1 per cent of replacement value.

Insurance Industry and National Economy Capacity to Bear Risk

128. From the estimate of $936 billion for the value of national assets exposed to risk and records showing total property sums insured of $76 billion exposed to earthquake and $14 billion exposed to windstorm, and sums of $16 billion insured for earthquake and $2.8 billion for windstorm, estimates can be made for worst case loss scenarios.

129. One should be prepared for overall losses of between $0.1 billion and $18.7 billion in the event of an earthquake of MM 7.0 magnitude affecting an area in which 10 per cent of assets are concentrated. If all the insured property were covered for earthquake risk, and only 10 per cent by value was located within the earthquake area expected losses would be between $76 million and $1.52 billion compared with the insurance industry's total non-life capital of $123 million and non-life annual premiums of $990 million.

130. Actual sums insured against earthquake in Turkey are $16 billion. The highest accumulation of sums insured is in Istanbul, with about 33 per cent of the total. At this level of accumulation, one would expect earthquake claims of between $160 million and $3.2 billion if the earthquake were to affect the whole of this area.

131. To cover a national earthquake exposure allowing for an accumulation equivalent of 10 per cent of total assets being within the earthquake zone would require financing or funding arrangements equivalent to 12 per cent of the GNP. For a return period of 100 years this would equate to an annual change of about 0.12 per cent of the GNP.

132. Funding includes both public-sector and private-sector facilities and if Turkey is fortunate in not being subject to a serious loss for some years, there is a possibility that funding could cover future losses. In the meantime, to cover the period whilst catastrophe funds are further built up, it may be prudent to ensure that contingency financing arrangements are established and continually reviewed to meet the cost of unfunded losses should a catastrophe occur. As in other countries, measures for protection against fluctuation of the Turkish currency in the aftermath of such large losses should be a component of any strategy.

TURKEY
COUNTRY CATASTROPHE INSURANCE PROFILE

Country Demographics	
Population: 60.2 million	**Population Growth Rate: 2.1 per cent**
Land Area: 779,452 sq.km.	**Overall Density: 65 per sq km**
Major Cities	**City Population**
Adana	1.4 million
Ankara	3.0 million
Bursa	1.0 million
Gaziantep	0.8 million
Istanbul	6.4 million
Izmir	2.7 million
Konya	1.0 million
	Total City Population 26 million
	Rural Population Density 44 per sq km

EXPOSURE TO NATURAL PERILS		
Peril	Return period	Severity
Earthquake	For the North Anatalian	-
-	approx. every 16 yrs.	MM. 6.0 (magnitude)
-	approx. every 100 yrs.	MM. 7.0 (magnitude)
Windstorm	9,000 yrs per location	Tornado (400km/h)

INSURANCE INDUSTRY RELATIVE CATASTROPHE CAPACITY	(1993 Figures)
Number of Non-Life Insurance Companies	38
Number of Reinsurance Companies	4

FINANCIAL SUMMARY *		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Total Non-Life Capital	15	108
Unearned Premium Reserves	39	143
Claims Reserves	19	112
Free Reserves	3	11
Gross Inward Reinsurance Premiums	8	14
Total Annual Premiums	201	789

FINANCIAL SUMMARY *		US$ MILLIONS
	Public-Sector Insurers	Private-Sector Insurers
Gross Outward Reinsurance Premiums	84	360
Net Annual Premiums	117	429
Total Property Sums Insured	N/A	N/A
Total Property Insurance Premiums (i.e. Fire & Perils)	43	150
Total Catastrophe Premiums (Included in Total Property Premiums)	8	32
Lower and Upper Sums Insured by Catastrophes Reinsurance Treaties Purchased in International Markets	Lower: 9 Upper: 42	L: 1 U: 77
Total Annual Cost of Such Treaties	Lower: 0.3 Upper: 1.1	0.02 1.5

* Estimate derived using assumptions described in the text under Infrastructure Replacement Costs.

PROVISION OF CATASTROPHE COVER IN THE TURKISH MARKET	
Catastrophe perils local insurers provide as an extension to their standard policies	Earthquake
Percentage of policies having such extensions	40 per cent
Percentage deductible required in respect of cover against catastrophe perils	2 per cent deductible and 10 per cent coinsurance
The deductibles and coinsurance are a percentage of the sum insured.	

NATIONAL FINANCIAL RESOURCES	
Gross National Product	US$ 156 billion (1992)
Growth Rate in Monetary Terms 1991/92	4 per cent
Value of Currency Unit	19879 in SDRs 1993
Value of Currency Unit	1448 in SDRs 1987
Currency Inflation relative to SDRs	55 per cent
Foreign Currency Reserves 1993	US$ 6822 million
Gold Reserves 1993	US$ 1410 million

VALUES AT RISK — **US$ millions**

Peril	Replacement value of property at risk	Insured against catastrophe peril
Earthquake*	76,357	15,944
Windstorm	13,820	2,760

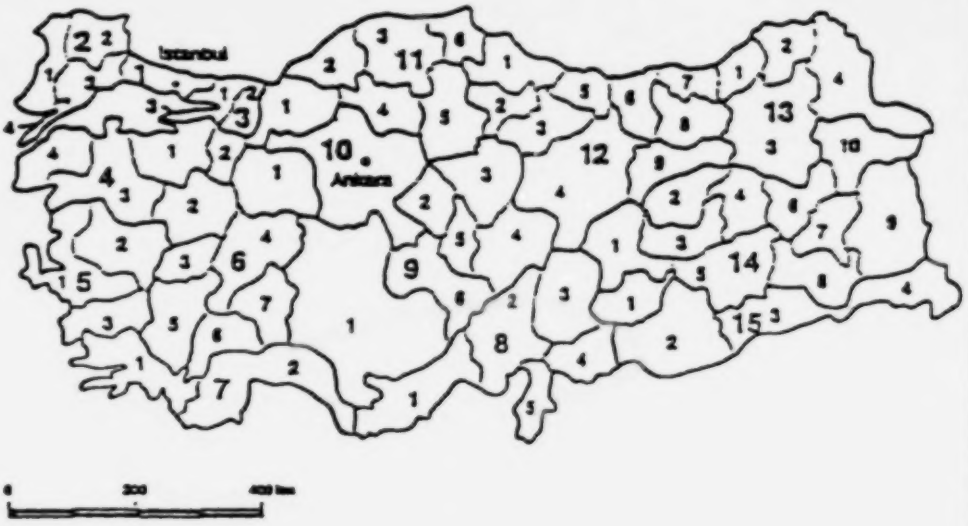
*It is estimated that approximately 20 per cent of property was insured against earthquake perils in 1992

TARGET RISKS - LOCATION AND VALUES OF LARGEST SINGLE RISK — **US$ MILLIONS**

Value	Risk (name of enterprise)	Location (town/province, etc.)	Catastrophe perils to which exposed (Earthquake)
1316	Highways	Ankara-Gerede	Degree: 1,2,3,4 Zone: 10
726	Toyotasa Auto Assembly	Adapazari-Sakarya	Degree: 1 Zone: 3
658	Atatürk Dam	Kahramanmaraş	Degree: 4 Zone: 15
609	Iron Steel Mill	İskenderun-Hatay	Degree: 2 Zone: 8
582	Highways	Tarsus-Gaziantep	Degree: 2,3,4 Zone: 8
566	Tüpraş Petroleum Refinery	Aliağa-İzmir	Degree: 1 Zone: 5
547	Underground	Ankara	Degree: 4 Zone: 10
511	Tüpraş Petroleum Refinery	Ankara	Degree: 4 Zone: 10
459	Highways	İzmir-Urla	Degree: 1 Zone: 5
377	Underground	İstanbul	Degree: 2 Zone: 1

ACCUMULATION RISK US$ MILLIONS

Total Value in Zone	Zone Number	Town/region/ urban area	Value insured against catastrophe perils	Catastrophe perils to which exposed
Not Available	Zone 1	İstanbul (excluding Yalova)	25,120	Earthquake
Not Available	Zone 10	Ankara-Kirikkale	7,809	Earthquake
Not Available	Zone 5	İzmir, Manisa, Aydin	7,509	Earthquake
Not Available	Zone 4	Bursa, Bilecik, Balikesir, Canakkale	6,864	Earthquake
Not Available	Zone 8	Mersin, Adana, K.Maras, G. Antep, Hatav	6,449	Earthquake
Not Available	Zone 3	İzmit, Adapazari, Yalova	4,512	Earthquake
Not Available	Zone 2	Edirne, Kirklareli, Tekirda	3,572	Earthquake
Not Available	Zone 7	Muğla, Antalya	3,272	Earthquake
Not Available	Zone 6	Eskişehir, Kütahya, Uşak, Afyon, Denizli, Burdur, Isparta	2,316	Earthquake
Not Available	Zone 12	Samsun, Amasya, Tokat, Siyas, Ordu, Giresun, Trabzon, Gümüşhane, Erzincan, Bayburt	1,585	Earthquake



Zone 1	Istanbul (excl. Yalova)	
Zone 2	1 Edirne	
	2 Kırklareli	
	3 Tekirdağ	
	4 Çanakkale (north of Dardanelles)	
Zone 3	1 İzmit (Kocaeli)	
	2 Adapazarı (Sakarya)	
	3 Yalova	
Zone 4	1 Bursa	
	2 Bilecik	
	3 Balıkesir	
	4 Çanakkale (south of Dardanelles)	
Zone 5	1 İzmir	
	2 Manisa	
	3 Aydın	
Zone 6	1 Eskişehir	
	2 Kütahya	
	3 Uşak	
	4 Afyon	
	5 Denizli	
	6 Burdur	
	7 Isparta	
Zone 7	1 Muğla	
	2 Antalya	
Zone 8	1 Mersin (İçel)	
	2 Adana	
	3 Maraş	
	4 Gaziantep	
	5 Antakya (Hatay)	
Zone 9	1 Konya	
	2 Karaman	
	3 Yozgat	
	4 Kayseri	
	5 Nevşehir	
	6 Niğde	
Zone 10	Ankara	
Zone 11	1 Bolu	
	2 Zonguldak	
	3 Kastamonu	
	4 Çankırı	
	5 Çorum	
	6 Sinop	
Zone 12	1 Samsun	
	2 Amasya	
	3 Tokat	
	4 Sivas	
	5 Ordu	
	6 Giresun	
	7 Trabzon	
	8 Gümüşhane	
	9 Erzincan	
Zone 13	1 Rize	
	2 Artvin	
	3 Erzurum	
	4 Kars	
Zone 14	1 Malatya	
	2 Tunceli	
	3 Bitlis	
	4 Bingöl	
	5 Diyarbakır	
	6 Muş	
	7 Bitlis	
	8 Siirt	
	9 Van	
	10 Ağrı	
Zone 15	1 Adıyaman	
	2 Urfa	
	3 Mardin	
	4 Hakkâri	

10/93

Notes

1. TD/B/CN.4/19.

2. TD/B/CN.4/32.